

Assessment of Innovation Effects of Mergers

Inaugural – Dissertation

zur

Erlangung der wirtschaftswissenschaftlichen Doktorwürde

des Fachbereichs Wirtschaftswissenschaften

der Philipps-Universität Marburg

eingereicht von:

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(Diplom-Ökonom aus Rastatt)

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Einreichungstermin: 22. Oktober 2014

Prüfungstermin: 28. Januar 2015

Erscheinungsort: Marburg

Hochschulkennziffer: 1180

Vorwort

Die vorliegende Dissertationsschrift wurde gemäß § 8 der Promotionsordnung des Fachbereichs Wirtschaftswissenschaften der Philipps-Universität Marburg vom 8. Juni 2009 als kumulative Leistung erstellt.

Intention der Zusammenfassung ist die Vorstellung der Zielsetzung sowie die Darstellung der einzelnen Teilleistungen zur inhaltlichen Zusammenführung der kumulativen Dissertationsleistung gemäß § 1 der Ausführungsbestimmungen nach § 8 Absatz 5 der Promotionsordnung des Fachbereichs Wirtschaftswissenschaften der Philipps-Universität Marburg vom 8. Juni 2009. Das Promotionsprojekt wurde von Prof. Dr. Wolfgang Kerber, Inhaber des Lehrstuhls für Wirtschaftspolitik, als Erstgutachter und von Prof. Dr. Michael Stephan, Inhaber des Lehrstuhls für Technologie- und Innovationsmanagement, als Zweitgutachter betreut. Die Dissertation ist überwiegend in den fünfzehn Jahren während meiner Tätigkeit als wissenschaftlicher Mitarbeiter am Lehrstuhl für Wirtschaftspolitik des Fachbereichs Wirtschaftswissenschaften an der Philipps-Universität Marburg entstanden.

Einer der in dieser kumulativen Dissertationsschrift enthaltenen Essays ist bereits publiziert, ein weiterer ist für eine Publikation eingereicht. Das Format der enthaltenen Essays entspricht daher entweder dem der originalen Formatierung der Publikation oder dem geforderten Format zur Einreichung als Paper. Auf die nachträgliche Einfügung von durchgehenden Seitenzahlen wurde verzichtet, da dadurch die Beiträge verändert würden und somit nicht mehr dem Originalzustand der publizierten oder eingereichten Version entsprächen. Zur Orientierung soll die Inhaltsübersicht auf den Seiten 3 und 4 dienen.

Danksagung

Auf dem langen Weg zur Erstellung dieser Dissertation bin ich von einer Vielzahl von Menschen begleitet und unterstützt worden, denen ich an dieser Stelle von Herzen danken möchte.

Mein besonderer Dank gilt meinem Doktorvater Prof. Dr. Wolfgang Kerber, Inhaber des Lehrstuhls für Wirtschaftspolitik an der Philipps-Universität Marburg. Ihm danke ich für den regen Austausch, sowie die konstruktiven Anregungen und Diskussionen, welche zu wichtigen Impulsen in meinem eigenen Forschungsprozess geführt haben. Danken möchte ich ihm auch für das in mich gesetzte Vertrauen und die großen Freiräume, welche er mir als Vorgesetzter und Betreuer während meiner akademischen Arbeit in Forschung und Lehre gewährt hat.

Weiterhin gilt meine Danksagung auch Herrn Prof. Dr. Michael Stephan, Inhaber des Lehrstuhls für Technologie und Innovationsmanagement an der Philipps-Universität Marburg, für die Übernahme des Zweitgutachtens.

Darüber hinaus möchte ich mich bei Prof. Dr. Josef Drexler (Max-Planck-Institut für Innovation und Wettbewerb) für seine Einladung zu einem Forschungsaufenthalt am ehem. Max-Planck-Institut für Immaterialgüter- und Wettbewerbsrecht bedanken.

Ich danke all meinen Freunden und Kollegen die mich während dieser Zeit begleitet und unterstützt haben. Besonderer Dank gilt in diesem Zusammenhang Julia Fritz, Ute Laermann-Nguyen, Julia Wendel, Michael Kohl, Severin Frank, Jürgen-Peter Kretschmer, Martin Schneider, Peter-Paul Gross, Malte Ackermann, Wanja Wellbrock, Kai Blume, Stefan Döpgen und Steffi Lorenz.

Mein ganz besonderer Dank richtet sich an meine Partnerin Katharina Fischer und meine Eltern Angelika und Harald Kern, die mich in vielen schwierigen Phasen immer wieder unterstützt und aufgebaut haben.

Marburg, im Oktober 2014

Benjamin René Kern

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Autor: Benjamin R. Kern

WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 37, 2, pp. 173-206 (2014)

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Mergers and the Incentives to Undertake Product Innovation Oriented R&D: First Steps Towards an Assessment Approach

Autoren: Benjamin R. Kern & Juan Manuel Mantilla Contreras

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Autoren: Benjamin R. Kern, Ralf Dewenter, Wolfgang Kerber

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Autoren: Wolfgang Kerber, Benjamin R. Kern

MIMEO (2014)

Zusammenfassung der kumulativen Dissertation
Assessment of Innovation Effects of Mergers
Benjamin René Kern

-Zusammenfassung in deutscher Sprache-

Die adäquate Berücksichtigung von Innovationswirkungen in der Folge von Unternehmenszusammenschlüssen in der Fusionskontrolle war und ist eines der am kontroversesten diskutierten Themen in der Wettbewerbspolitik. In diesem Zusammenhang wurde die Frage aufgeworfen, ob die traditionellen Kategorien des Wettbewerbsrechts für den Umgang mit Innovationsaspekten ausreichend geeignet sind, oder ob neue Konzepte für die Analyse von Innovationseffekten von Fusionen nötig sind. Dies wiederum hängt mit der Frage zusammen, ob die Unternehmen, die auf bestehenden Produktmärkten miteinander in Konkurrenz stehen, auch unweigerlich Innovationswettbewerber sind. Ebenso kann man umgekehrt fragen ob es, neben den sich aktuell auf einem Produktmarkt im Wettbewerb befindlichen Firmen, nicht vielleicht noch weitere Unternehmen gibt, die miteinander im Bereich der Innovation im Wettbewerb stehen. Obwohl die Verwendung von Produktmärkten als ein theoretisches Konstrukt zur Identifizierung der relevanten Wettbewerber ein bewährtes Instrument zum Schutz von statischem Preis und nicht über den Preis ausgetragenen Wettbewerbs ist, so wird der ausschließliche Fokus auf Produktmärkte höchst wahrscheinlich nicht die wahre Situation in Bezug auf den stattfindenden Innovationswettbewerb abbilden.

Entsprechend liegt jedem der fünf Beiträge dieser Dissertation die Annahme zugrunde, dass die relevanten Wettbewerber im Hinblick auf Innovationen nicht zwangsläufig den relevanten Wettbewerbern auf bestehenden Produktmärkten gleichen. Aus ökonomischer Sicht waren Produktmärkte seit je her lediglich ein Vehikel um diejenigen Firmen zu identifizieren, die sich miteinander im Wettbewerb befinden. Zum Schutz eines statischen Preiswettbewerbs war es somit auch nur folgerichtig die aktuell offerierten Produkte heranzuziehen und anschließend die Substitutionsbedingungen der Nachfrage- und Angebotsseite zur Bestimmung des relevanten Wettbewerbers zu analysieren. Allerdings ist der Versuch dieses Vorgehen auch auf die Identifizierung der relevanten Innovationswettbewerber anzuwenden, äußerst fragwürdig. Aufgrund der Tatsache, dass die Herstellung und der Vertrieb von bestehenden Produkten nicht die gleichen Ressourcen und Fähigkeiten erfordert wie die Generierung von Innovation, ist die Behauptung eines Zusammenfallens der Identität von Produktmarkt- und Innovationswettbewerbern nur schwer zu verteidigen. Diese Diskussion führte in den USA in den 1990er Jahren zur Entstehung der sogenannten "Innovation Market Analysis" (IMA), welche als ein erstes, innovationsspezifisches Analyseverfahren angesehen werden kann. Allerdings wurde die IMA, trotz der Tatsache, dass ihre Grundidee in einer signifikanten Zahl von US-Fusionsfällen angewandt wurde, stark kritisiert. Vor dem Hintergrund dieses mangelnden Zuspruchs für die "Innovation Market Analysis" und dem Fehlen eines alternativen, innovationsspezifischen Analyse Rahmens ist es bis heute immer noch unklar, wie die Kartellbehörden im Rahmen der Prüfung von Unternehmenszusammenschlüssen Innovationsaspekte berücksichtigen sollten.

Dieses Forschungsprojekt untersucht daher, wie und in welchem Ausmaß die US-Wettbewerbsbehörden in ihrer Fallpraxis Unternehmenszusammenschlüsse auf negative Innovationswirkungen hin geprüft haben und ob die verwendeten Prüfverfahren für diesen Zweck geeignet sind oder weiterentwickelt werden müssen. Besonders relevant ist in diesem Zusammenhang (1) wie die Firmen, die miteinander im Innovationswettbewerb stehen, identifiziert werden sollten. Hierbei stellt sich die Frage ob zur Identifikation der relevanten Wettbewerber weiterhin die traditionelle Definition des Produktmarktes verwendet werden sollte, oder ob vielmehr die Notwendigkeit besteht, anstatt dessen alternative Ansätze, wie z.B. die "Innovation Market Analysis", heranzuziehen / zu entwickeln. (2) Dabei soll zudem untersucht werden, welche Argumentationslinien im Hinblick auf die vorgebrachten wettbewerbsbeschränkenden Innovationswirkungen von den Behörden verwendet wurden. Sollten sich die Wettbewerbsbehörden hierbei vorwiegend auf die etablierten Argumente der neoklassischen Industrieökonomik zu Innovationsanreizen stützen, oder sollten auch die Erkenntnisse der eher heterodoxen Evolutionsökonomik mit einbezogen werden? (3) Wie sollte ein geeignetes Prüfschema, das den Wettbewerbsbehörden hilft die Innovationswirkungen von Fusionen zu untersuchen, ausgestaltet sein? Ist es möglich, dass solch ein Prüfschema einerseits die komplexen und oft divergierenden Effekte zwischen Wettbewerb und Innovation adäquat berücksichtigt und trotzdem gleichzeitig Rechtssicherheit stiftet?

Diesen Forschungsfragen widmet sich die vorliegende Dissertation sowohl von einer theoretisch/konzeptionellen Perspektive (Beiträge 1-3), wie auch von empirischer Seite (Beiträge 4-5). Insbesondere der im Zusammenhang mit dem empirischen Teil der vorliegenden Arbeit generierte Datensatz ist einzigartig und liefert die Basis für die bislang einzige ökonometrische Analyse der U.S.-Fusionskontrollpraxis im Hinblick auf die Berücksichtigung von Innovationsaspekten.

1. Benjamin R. Kern (2014): *Innovation Markets, Future Markets, or Potential Competition: How should Competition Authorities account for Innovation Competition in Merger Reviews?*, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 37, pp. 137-206.
(Geleistete Beiträge: Benjamin R. Kern: 100%)

Der erste Artikel der vorliegenden Dissertation befasst sich daher zunächst mit der Frage, wie die Unternehmen, die miteinander im Innovationswettbewerb stehen, identifiziert werden sollten und ob die entsprechenden Unternehmenszusammenschlüsse mit Hilfe der Theorie der „Innovation Markets“, „Future Markets“ oder des potenziellen Wettbewerbs aufgegriffen werden sollten. Traditionell konzentrieren sich die Wettbewerbsbehörden im Rahmen der Zusammenschlusskontrolle auf die Analyse von relevanten Produktmärkten. Hierbei werden die relevanten Firmen, die sich miteinander im Wettbewerb befinden, identifiziert und mögliche wettbewerbswidrige Effekte aufgedeckt. Im Gegensatz zu Wettbewerb in Hinblick auf Preise, Mengen, oder Produktqualität, findet der Wettbewerb im Bereich der Innovation allerdings nicht zwangsläufig auf bestehenden Produktmärkten statt. Dieser erste Aufsatz untersucht daher die (bestehenden) theoretischen Ansätze, die grundsätzlich für die Überprüfung von wettbewerbswidrigen Innovationseffekten in der Zusammenschlusskontrolle verwendet werden können, anhand ausgewählter Fusionsfälle aus der Fusionskontrollpraxis.

In diesem Zusammenhang werden in diesem Beitrag sechs Gruppen von Fusionsfällen, in denen Innovationsaspekte eine Rolle gespielt haben, entwickelt. Auf Basis dieser Fallgruppen zeigt das Papier, dass die etablierten Ansätze des "potenziellen Wettbewerbs" wie auch der "Future Markets" nicht immer in der Lage sind, den stattfindenden Innovationswettbewerb zu erfassen. Darüber hinaus ist es fraglich, ob das Konzept der "Future Markets", auch in jenen Fällen, in denen der Ansatz grundsätzlich angewandt werden kann, tatsächlich dazu geeignet ist, den Innovationswettbewerb mit all seinen Facetten abzubilden. Auf der anderen Seite hat aber auch die "Innovation Market Analysis", bis heute der einzige Ansatz der speziell zur Analyse des Innovationswettbewerbs entwickelt wurde, mehrere Schwachstellen. Vor diesem Hintergrund kommt der Beitrag zu dem Ergebnis, dass aktuell kein allgemein akzeptierter Ansatz existiert, welchen die Kartellbehörden in den USA wie auch in der EU als Analyserahmen zum Schutz des Innovationswettbewerbs in der Fusionskontrolle heranziehen könnten. Die Entwicklung eines neuen bzw. überarbeiteten Analyseansatzes scheint somit dringend geboten. Nichts desto trotz stellt die "IMA" einen guten Ausgangspunkt für die Entwicklung eines solchen Analyserahmens dar. Insbesondere die Eigenschaft der "Innovation Market Analysis", dass diese zum ersten Mal die relevanten Innovationswettbewerber unabhängig von deren Rolle und Bedeutung auf existierenden Produktmärkten berücksichtigt, sollte auch Teil eines neuen / überarbeiteten Ansatzes sein.

2. Benjamin R. Kern & Juan Manuel Mantilla Contreras (2014): *Mergers and the Incentives to Undertake Product Innovation Oriented R&D: First Steps Towards an Assessment Approach*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.17-2014, available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/17-2014_kern.pdf.

(**Geleistete Beiträge:** Benjamin R. Kern: 60%, Juan Manuel Mantilla Contreras: 40%)

Der zweite Artikel baut anschließend auf den Ergebnissen des ersten Artikels auf. Hierbei zielt das Papier darauf ab einen ersten Beitrag zur Entwicklung eines neuen / überarbeiteten Analyserahmens für die Überprüfung von Innovationswirkungen im Rahmen der Fusionskontrolle zu liefern. Daneben soll mit diesem Papier aber auch der unzureichenden Berücksichtigung der Implikationen Rechnung getragen werden, die sich aus der separaten Betrachtung des Innovationswettbewerbs vom Produktmarktwettbewerb für den Zusammenhang zwischen Wettbewerb, Konzentration und Innovation ergeben. Entscheidend ist hierfür, dass die Unterscheidung in Produktmarkt- und Innovationswettbewerb nicht nur Konsequenzen für die Identifizierung der relevanten Wettbewerber hat, sondern zudem entscheidend für die Beurteilung der antikompetitiven Innovationseffekte von Fusionen ist.

Im Falle einer Fusion von zwei Firmen, die ausschließlich miteinander in Bezug auf Innovation konkurrieren, würde der aktuell stattfindende Produktmarktwettbewerb unberührt bleiben. Dies würde jedoch bedeuten, dass nur ein Bruchteil der Erkenntnisse, welche die Vielzahl der modelltheoretischen Beiträge insgesamt beisteuert, in einem solchen Fusionsfall herangezogen werden kann. Anstatt dessen erfordert die Beurteilung solcher Fusionen eine Fokussierung auf die Erkenntnisse, die auf Basis von ökonomischen Modellen gewonnen wurden, die diesem Sachverhalt ebenfalls Rechnung tragen. Hierbei handelt es sich jedoch in vielen Fällen um gänzlich andere Modelle als jene, deren Ergebnisse bei der Beurteilung der

Innovationswirkungen einer Fusion zwischen zwei Produktmarktwettbewerbern Anwendung finden sollten. In Folge dessen ist es äußerst fraglich, ob die Kritik hinsichtlich des ambivalenten Zusammenhangs zwischen Produktmarktwettbewerb und Innovation in gleichem Maße für den Zusammenhang zwischen Innovationswettbewerb und Innovation zutreffend ist.

Vor dem Hintergrund dieser Unterscheidung in Innovationswettbewerb auf der einen Seite und Produktmarktwettbewerb auf der anderen Seite, analysiert der vorliegende Aufsatz den Zusammenhang zwischen dem vorherrschenden „Wettbewerb“ und den Anreizen der Unternehmen in Produktinnovationen zu investieren. Im Zuge dessen wird die umfangreiche modelltheoretische Industrieökonomik-Literatur dahingehend untersucht, ob die Wirkungsmechanismen, welche den jeweiligen Modellen zugrunde liegen, in einem auf Produktmärkten stattfindenden Wettbewerb verankert sind oder nicht. In Folge dessen werden in diesem Papier zwei Gruppen von möglichen Innovationseffekten von Fusionen identifiziert. Während die erste Gruppe solche Effekte beinhaltet, die durch eine Veränderung des aktuellen Produktmarktwettbewerbs hervorgerufen werden, umfasst die zweite Gruppe jene Innovationseffekte, welche auch dann eine Wirkung auf die Innovationsanreize der Firmen haben, wenn die Fusion keine Auswirkungen auf bestehende Produktmärkte hat.

Aufgrund der Tatsache, dass in einem konkreten Fusionsfall nicht zwangsläufig jeder der identifizierten Innovationseffekt relevant ist und diese, je nach Beschaffenheit der entsprechenden Branchen- / Wettbewerbscharakteristika, zudem unterschiedliche Wirkungsrichtungen entfalten können, ist es notwendig die Innovationswirkungen innerhalb bestimmter Fallgruppen zu überprüfen. Zur Bildung dieser Fallgruppen müssen jedoch zunächst Unterscheidungskriterien entwickelt werden. Zu diesem Zweck versucht dieser Artikel die Determinanten zu identifizieren, die in einem konkreten Fall entscheidend dafür sind, wie sich ein bestimmter Innovationseffekt (z.B. der „escape competition effect“ oder der „replacement effect“) auf die Innovationsanreize auswirkt. Die Identifizierung und Kategorisierung der Innovationseffekte zuzüglich der relevanten Determinanten bietet damit (1) eine Checkliste von Beurteilungskriterien, die Wettbewerbsbehörden bei der Analyse der Innovationswirkungen von Fusionen berücksichtigen sollten. (2) Darüber hinaus wird in diesem Beitrag beispielhaft gezeigt, wie die Entwicklung eines entscheidungstheoretischen Analyserahmens zur Beurteilung von Innovationswirkungen von Unternehmenszusammenschlüssen erfolgen kann. Solch ein Analyserahmen würde es ermöglichen, die Notwendigkeit einer fallspezifischen Prüfung von Fusionen mit der Forderung nach einem konsistenten und transparenten Prüfverfahren in Einklang zu bringen. Ein solches Verfahren wäre somit im Geiste einer regelgeleiteten Wettbewerbspolitik die, von der „Law and Economics“ Perspektive aus betrachtet, Fehlerkosten minimieren und Rechtssicherheit stiften könnte.

Des Weiteren zeigt das Papier, dass der Zusammenhang zwischen dem vorherrschenden „Wettbewerb“ und den hierdurch hervorgerufenen Innovationsanreizen nicht immer so ambivalent ist, wie es auf den ersten Blick erscheint. Insbesondere im Hinblick auf Fusionen zwischen Unternehmen, die miteinander ausschließlich im Innovationswettbewerb und nicht im Produktmarktwettbewerb stehen, ist dieser Zusammenhang deutlich stabiler.

3. Benjamin R. Kern & Malte Ackermann (2014): *Shedding Some Light on the Dark Matter of Competition: Insights from the Strategic Management & Organizational Science Literature for the Consideration of Diversity Aspects in Merger Review*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.05-2014, available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/05-2014_ackermann.pdf.
(Geleistete Beiträge: Benjamin R. Kern: 80%, Malte Ackermann: 20%)

Der dritte Artikel beschäftigt sich daraufhin mit der Frage nach den zu erwartenden wettbewerbsbeschränkenden Innovationswirkungen von Fusionen. Traditionell hat sich diese Diskussion mit der Frage beschäftigt, ob eine wettbewerbliche - oder vielmehr eine hoch konzentrierte Marktstruktur (meist die Marktstruktur eines Produktmarkts) für Innovationen förderlich ist. Die Gesamtschau der hierzu verfassten theoretischen und empirischen Beiträge lieferte jedoch äußerst widersprüchliche Ergebnisse, sodass man grundsätzlich davon ausgehen muss, dass in hohem Maße wettbewerbliche - ebenso wie hoch konzentrierte Märkte prinzipiell dazu geeignet sind, Innovationen zu fördern. Vor diesem Hintergrund ist es somit unklar, ob eine Fusion, die zu einer höheren Marktkonzentration führt, tatsächlich innovationsschädlich oder doch innovationsfördernd ist.

Im Gegensatz zur Mainstream-Ökonomie, welche sich fast ausschließlich mit den Auswirkungen einer geänderten Marktstruktur auf die Anreize der Unternehmen in Forschung und Entwicklung zu investieren befasst, kann eine Änderung der Marktstruktur jedoch zusätzliche Wirkungen auf Innovationen haben. Beispielsweise kann eine Fusion, welche eine Reduzierung der Anzahl der Wettbewerber nach sich zieht, auch insofern innovationsschädlich sein, dass hierdurch die Anzahl der Unternehmen, die derzeit bestimmte F&E Projekte verfolgen (oder entsprechende Projekte prinzipiell verfolgen könnten), reduziert wird. Gesetzt den Fall, dass sich Unternehmen nicht nur bezüglich ihrer Kostenfunktionen, sondern auch hinsichtlich ihrer Ressourcen, Organisationsstruktur, Unternehmenskultur, sowie ihrer Erwartungen in Hinblick auf erfolgsversprechende Geschäftsfelder und Forschungsprojekte unterscheiden, kann sich bereits die Reduktion der Anzahl der Wettbewerber nachteilig auf die Innovationskraft einer Branche auswirken. Vor diesem Hintergrund kann die "Diversität" als eine weitere Dimension des Innovationswettbewerbs angesehen werden - eine Dimension die neben den Überlegungen zu Innovationsanreizen und -fähigkeiten von Unternehmen, ebenfalls schützenswert sein kann.

Diese Eigenschaft des Wettbewerbs wird in der wettbewerbspolitischen Literatur jedoch nur am Rande berücksichtigt. Die geringe Beachtung könnte dem Umstand geschuldet sein, dass die Mainstream-Ökonomie und vor allem die moderne Industrieökonomik grundlegende Schwierigkeiten haben, diese Dimension des Wettbewerbs, welche Joseph Farrell anschaulich die „dunkle Materie des Wettbewerbs“ nannte, zu erfassen. Abgesehen davon wird zudem oftmals das Argument angeführt, dass die Unternehmen selbst, wenn "Diversität" tatsächlich eine positive Wirkung auf die Innovationsfähigkeit von Unternehmen hat, auch nach einer Fusion einen Anreiz haben sollten, solch ein innovationsförderndes Umfeld „in-house“ zu bewahren. Sollte dieses Argument zutreffend sein, so könnte eine mögliche Verringerung der "Diversität" zwischen den verschiedenen Firmen (inter-firm) dadurch kompensiert werden, dass solch einer Reduktion der „Diversität“ eine entsprechende Erhöhung der „Diversität“ innerhalb der verbleibenden Firmen ("intra-firm") gegenüber steht. Wenn man solch einen

Effekt zu erwarten hätte, bestünde folglich keine Veranlassung, dass die Kartellbehörden der „Diversität“ im Rahmen der Zusammenschlusskontrolle eine besondere Bedeutung beimessen.

Unter Berücksichtigung der Management- und organisationstheoretischen Literatur zielt dieser erste Artikel daher auf die Klärung der Forschungsfrage ab, ob und in wie weit, Unternehmen nach einer Fusion zur Aufrechterhaltung der „Diversität“ beitragen. Dies kann entweder durch eine neu geschaffene „intra-firm Diversität“ oder im Rahmen einer Wahrung der bestehenden „Diversität“ in Folge der Fortführung der Autonomie des erworbenen Unternehmens erfolgen. Zu diesem Zweck werden in dem Beitrag zunächst die Erkenntnisse der "Corporate Entrepreneurship" (CE) Literatur untersucht. Hierbei zeigt sich, dass dieser Forschungsbereich die Schaffung von unabhängigen Unternehmenseinheiten und damit die Erzeugung von "Diversität" innerhalb der Firma tatsächlich als einen wichtigen Faktor für die Innovationskraft und allgemeine Performance von Unternehmen anerkennt. Es stellt sich jedoch heraus, dass Unternehmen die eine CE-Strategie verfolgen, in den meisten Fällen auf erhebliche Umsetzungsprobleme und verschiedene Zielkonflikte stoßen. Gleiches gilt für die Aufrechterhaltung von "Diversität" in Folge einer Fortführung der Autonomie nach einer Fusion. Obwohl die „post-merger-integration“ Literatur starke Argumente für eine Aufrechterhaltung der Unabhängigkeit von erworbenen Unternehmen zur Wahrung ihrer Innovationsfähigkeit liefert, wird dennoch deutlich, dass auch in diesem Fall ein „Trade-off“ zwischen dem Ziel der Wahrung der Innovationsfähigkeit und der Realisierung von statischen Effizienzgewinnen durch Integration, besteht. Auf der einen Seite verdeutlicht die umfangreiche Management- und organisationstheoretische Literatur somit auf anschauliche Art und Weise, dass die Unternehmen tatsächlich einen starken Anreiz zur Wahrung der „Diversität“ innerhalb des eigenen Unternehmens haben sollten. Auf der anderen Seite demonstriert das Papier aber auch, dass sich Konsumenten und Wettbewerbsbehörden nicht ohne weiteres darauf verlassen können.

4. Benjamin R. Kern, Ralf Dewenter, Wolfgang Kerber (2014): *Empirical Analysis of the Assessment of Innovation Effects in U.S. Merger Cases*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.50-2014 (2014), available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/50-2014_kerber.pdf.

(**Geleistete Beiträge:** Benjamin R. Kern: 70%, Ralf Dewenter: 15%, Wolfgang Kerber: 15%)

Während sich die ersten drei Artikel eher mit theoretisch / konzeptionellen Fragestellungen beschäftigen, untersucht der vierte Beitrag empirisch wie die US-Kartellbehörden in der angewandten Fusionskontrolle Innovationseffekte berücksichtigt haben. Die Entscheidung zur Analyse der US-amerikanischen Fusionskontrollpraxis rührt daher, dass die US Behörden, im Gegensatz zur Europäischen Kommission, eine weitaus größere Anzahl von Unternehmenszusammenschlüssen auf Innovationswirkungen hin überprüft haben.

Auf Basis der "Complaints" sowie der „Decision and Orders“ analysiert das vorliegende Papier daher im Rahmen einer Vollerhebung alle 399 Zusammenschlüsse die durch das Department of Justice (DOJ) oder die Federal Trade Commission (FTC) in der Zeit zwischen 1995 und 2008 aufgegriffen wurden. Unter Verwendung der Probit-Methode beschäftigt sich die ökonometrische Studie insbesondere mit der Frage, auf welche Weise und in welchem

Umfang die US-amerikanischen Wettbewerbsbehörden Fusionen auf Innovationseffekte hin überprüft haben. Darüber hinaus untersucht der Beitrag ob die beiden Behörden identische oder unterschiedliche Ansätze für die Überprüfung der Innovationswirkungen von Fusionen verwendet haben und ob sich im Laufe der Zeit möglicherweise Änderungen in der Fallpraxis beobachten lassen. Wichtige Fragen sind in diesem Zusammenhang, (1) ob die US-Behörden überwiegend einen traditionellen, auf dem Produktmarkt-Konzept basierenden Analyserahmen verwendeten, oder ob sie auch innovationsspezifischere Ansätze, wie z.B. die "Innovation Market Analysis", herangezogen haben. (2) Daneben ist es von Bedeutung welche Argumentationslinien im Hinblick auf die vorgebrachten wettbewerbsbeschränkenden Innovationswirkungen von den Behörden verwendet wurden.

Vor dem Hintergrund dieser Fragestellungen kommt der Beitrag zu folgenden Ergebnissen. Es zeigt sich, dass in 135 der 399 Fälle die Behörden antikompetitive Innovationseffekte erwarteten und, dass während des gesamten Zeitraums beide Behörden in circa einem Drittel der Fälle (auch) auf antikompetitive Innovationswirkungen abgestellt hatten. Auf Basis der analysierten 323 relevanten Märkte mit Innovationsaspekten offenbart die durchgeführte Studie allerdings auch, dass die beiden Behörden über keinen einheitlichen Analyserahmen verfügen, und sie sich insbesondere hinsichtlich der Frage, ob eher ein traditioneller Produktmarkt-Ansatz oder doch eher ein innovationsspezifischer Ansatz angewendet werden sollte, signifikant unterscheiden. Ein kritisches Ergebnis ist zudem, dass in den meisten Fällen, in denen die Behörden negative Innovationswirkungen befürchteten, keine genaue Begründung, weshalb die Fusion möglicherweise wettbewerbswidrige Innovationswirkungen haben könnte, abgegeben wurde. Lediglich eine Minderheit der Fälle liefert Argumente im Zusammenhang mit negativen Innovationsanreizen oder beinhaltet solche Argumente die den Schutz der „Diversität“ für Innovation hervorheben. Ein weiteres äußerst überraschendes und durchaus auch rätselhaftes Ergebnis ist, dass die Behörden in den Fällen in denen innovationsschädliche Effekte erwartet wurden, zunehmend auch statische Preiseffekte ins Feld führten. Vor dem Hintergrund der Differenzierung in Innovationswettbewerb und Produktmarktwettbewerb gibt diese beobachtete Zunahme der simultan vorgebrachten Innovations- und Preiseffekte jedoch Rätsel auf. Dieses Phänomen kann dahingehend gedeutet werden, dass die U.S.-Wettbewerbsbehörden in Folge der kritischen Diskussion um die „Innovation Market Analysis“ versucht haben, die von ihnen befürchteten Innovationseffekte zusätzlich mit traditionellen und besser etablierten Argumenten im Zusammenhang mit wettbewerbsbeschränkenden Preiseffekten abzusichern.

Der Beitrag zeigt damit, dass die Berücksichtigung von Innovationswirkungen zwar stets ein fester Bestandteil der U.S.-amerikanischen Fusionskontrollpraxis war. Dieser Praxis lag allerdings weder ein konsistenter Ansatz zugrunde, noch scheinen sich die damit verbundenen konzeptionellen Fragen zum geeigneten Analyserahmen, oder der Argumentationslinie hinsichtlich der erwarteten wettbewerbswidrigen Innovationswirkungen im Laufe der Zeit geklärt zu haben.

5. Wolfgang Kerber / Benjamin R. Kern (2014): *Assessing Innovation Effects in US Merger Policy: Theory, Practice, Recent Discussions, and Perspectives*, Mimeo.
(**Geleistete Beiträge:** Benjamin R. Kern: 50%, Wolfgang Kerber: 50%)

Der fünfte und letzte Beitrag dieser Dissertation baut vorwiegend auf den empirischen Ergebnissen des vierten Artikels auf und zielt darauf ab, diese Ergebnisse unter Einbeziehung der gewonnenen Erkenntnisse aus den ersten drei theoretisch/konzeptionellen Papieren in einen größeren Rahmen zu setzen. Zu diesem Zweck wird zu Beginn dieses Artikels nochmals ein detaillierter Überblick über die umfangreiche modelltheoretische und empirische Literatur zum Thema Wettbewerb und Innovation gegeben. In diesem Zusammenhang werden die verschiedenen theoretischen Modelle und Argumente, vor dem Hintergrund der im Rahmen des zweiten Papiers vorgeschlagenen Differenzierung zwischen denjenigen Modellen, die ausschließlich den Wettbewerb im Hinblick auf Innovation betrachten und solchen die auch aktuelle Produktmärkte einbeziehen, vorgestellt. Dieser strukturierte Überblick ist gefolgt von einer Analyse der empirischen Studien zum Zusammenhang zwischen Branchenstrukturen und Innovation, Marktstruktur und Innovation und Unternehmenszusammenschlüssen und Innovation.

Nachdem daraufhin die existierenden Analyserahmen für die Überprüfung von Innovationswirkungen im Rahmen der Fusionskontrolle vorgestellt wurden, werden die empirischen Ergebnisse des vierten Beitrags nochmals vorgestellt und aus wettbewerbspolitischer Perspektive analysiert. Daneben wird in diesem Artikel zudem eine (qualitative) Analyse der wichtigsten Innovationsfusionsfälle nach 2008 vorgenommen sowie ein Überblick über die Diskussion im Zuge der Überarbeitung der aktuellen US-Fusionskontrollrichtlinien gegeben. In diesem Zusammenhang zeigt der Beitrag, (1) dass die Unsicherheiten bei der Berücksichtigung von Innovationseffekten auch unter der Obama-Administration nicht verschwunden sind und, (2) dass trotz des allgemeinen Konsens hinsichtlich der enormen Bedeutung von Innovationen für die Konsumentenwohlfaht die Verwendung von innovationsspezifischen Prüfverfahren in der US-Diskussion immer noch sehr kritisch gesehen wird.

Dies zeigt sich auch bei Betrachtung der neuen US-Fusionskontrollrichtlinien, die sich weiterhin ganz auf den traditionellen Produktmarktansatz stützen. Insofern tragen die Leitlinien auch nicht der bereits etablierten Fusionskontrollpraxis der US-Kartellbehörden Rechnung, welche in den vergangenen Jahren bereits innovationsspezifische Ansätze in nicht unerheblichen Umfang anwendeten. Anstatt dessen scheint auch diese Zurückhaltung bei der Aufnahme eines innovationsspezifischen Analyserahmens in die Fusionskontrollrichtlinien das Ergebnis einer nicht zu unterschätzenden Unsicherheit im Umgang mit Innovationswirkungen zu sein. Wie schon die Ergebnisse der empirischen Analyse im vierten Beitrags dieser Dissertation zeigte, scheint diese Unsicherheit in der Uneinigkeit darüber begründet zu sein, wie die Wettbewerbsbehörden die Innovationswirkungen einer Fusion richtig erfassen und beurteilen sollten.

Dieser Artikel schließt daraufhin indem zukünftige Forschungsfragen aufgezeigt werden. In diesem Zusammenhang wird (1) vorgeschlagen, dass sich die Argumente hinsichtlich der wettbewerbswidrigen Innovationswirkungen von Unternehmenszusammenschlüssen nicht ausschließlich auf die neoklassische Industrieökonomik stützen sollte, sondern auch die

Erkenntnisse der Evolutionsökonomik mit einbeziehen sollten, welche sich ohnehin besser zur Analyse von dynamischen Innovationseffekten eignet. (2) Des Weiteren sollte sich die zukünftige Forschung mit der Frage beschäftigen, wie die relevanten Innovationswettbewerber am zuverlässigsten identifiziert werden können. Der erste Beitrag dieser Dissertation hat gezeigt, dass die "Innovation Market Analysis" bereits die richtigen Fragen im Hinblick auf sich überlappende Forschungsprojekte und die Existenz von "specialized assets", welche als Eintrittsbarrieren in den Innovationswettbewerb verstanden werden können, gestellt hat. (3) Last but not least, kommt dieses fünfte Papier auf die zentrale Frage des zweiten Artikels dieser Dissertation zurück in welchem bereits die Notwendigkeit der Entwicklung eines strukturierten Analyserahmens zur Beurteilung von Innovationseffekten von Fusionen diskutiert wurde. Solch ein Analyserahmen sollte mit dem Problem umgehen können, dass Innovationseffekte unter verschiedenen Umständen sehr unterschiedlich ausfallen können.

Summary of Doctoral Dissertation
Assessment of Innovation Effects of Mergers
Benjamin René Kern

-Zusammenfassung in englischer Sprache-

The adequate consideration of innovation effects of mergers in merger review was, and still is, one of the most controversially discussed issues between antitrust scholars. In this connection the question has been raised whether the traditional categories in competition law are sufficiently suitable for dealing with innovation aspects or whether new concepts for the assessment of innovation effects of mergers are needed. This argument relates to the question whether the firms who compete in regard to existing products necessarily play a role in regard to innovation competition. Or, by asking the opposite question, whether there are perhaps additional firms (by also accounting for firms outside the current product market) that actually compete with one another in the sphere of innovation. Thus, although the assessment of product markets as a device to identify the relevant competitors is a well-founded step to protect static price and non-price competition, the sole assessment of the respective product market will probably not reflect the true situation regarding innovation competition.

Accordingly, each of the five articles of this thesis builds on the idea that the relevant competitors in terms of innovation do not necessarily correspond to the relevant competitors on existing product markets. From an economic perspective the definition of “markets” was always only a vehicle for identifying the set of relevant competing firms. In a concept of static competition, it was logical to use the set of current products, and analyze their substitutability conditions from the demand and the supply side in order to determine the set of relevant competitors. However, the attempt to stick to the product market concept for defining the relevant competitors for innovation is theoretically deeply flawed. Since the production and sale of products does not require the same resources and capabilities as the generation of innovations, a general assumption of such an identity cannot be defended. This discussion led to the development of the so-called "Innovation Market Analysis" (IMA), an innovation-specific assessment approach, in the 1990s. Even though the IMA was also applied to a significant number of U.S. merger cases in the years thereafter, it was heavily criticized by many lawyers and economists. Hence, it is still not clear how antitrust agencies should deal with innovation aspects in the review process of mergers.

This research project assesses how and to what extent the U.S. antitrust authorities in their case practice investigated mergers on possible negative effects on innovation and whether the investigation concepts are appropriate or need to be developed. Particular relevant questions which arise in this connection are: (1) how the firms, which compete with one another in the sphere of innovation, should be identified. This raises the question whether the identification of the relevant competitors should be carried out by relying on the traditional product market concept, or whether there is a need to use/develop alternative approaches, such as the "Innovation Market Analysis". (2) In this connection it is also necessary to consider the theory of harm behind the claimed negative effects of mergers on innovation. Should competition authorities rely predominantly on well-established arguments about innovation incentives,

provided by the neoclassical industrial organization literature, or is it instead advisable to also include the insights provided by other strains of literature, *e.g.* the evolutionary economics literature? (3) How should an adequate assessment framework, which would help competition authorities to deal with innovation effects of mergers look like? How can it account for the complex and often divergent effects between competition and innovation while providing legal guidance at the same time?

These research questions are addressed by this dissertation, both from a theoretical/conceptual (articles 1-3), as well as from an empirical perspective (articles 4-5). It is remarkable, that the data set which was generated in connection with the empirical part of the present work is unique and provides the basis for the only econometric analysis of the U.S. merger control practice with respect to the consideration of innovation aspects which exists so far.

1. Benjamin R. Kern (2014): *Innovation Markets, Future Markets, or Potential Competition: How should Competition Authorities account for Innovation Competition in Merger Reviews?*, WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 37, pp. 137-206.

(**Contributions:** Benjamin R. Kern: 100%)

The first article deals with the question of how the firms which compete with one another in the sphere of innovation should be identified and whether these mergers should be assessed under the theory of Innovation Markets, Future Markets or Potential Competition. Traditionally, competition authorities tend to focus on the assessment of competition on relevant product markets. Hereby, the relevant firms that compete with one another are identified, and possible anticompetitive effects are revealed. But, in contrast to competition concerning prices, quantities, or product quality, competition in the sphere of innovation is not necessarily tied to existing product markets. The same holds true for the counterexample. Competition authorities might find that a certain product market is highly concentrated. However, by also accounting for innovation competitors outside the current product market (*e.g.*, firms that are well situated to undertake R&D in a particular field or firms that are already undertaking R&D), the merger could appear less anticompetitive, at least in respect to innovation.

Hence, this first article reviews the (existing) approaches that can generally be used for the assessment of anticompetitive innovation effects in merger control and explores these approaches through exemplary merger cases. In this connection the paper develops six case groups of merger cases in which innovation aspects play a role. Based on these case groups, the paper demonstrates that the traditional approaches of ‘potential competition’ and ‘future markets’ cannot account for all aspects of innovation competition. In addition, the article also shows that it is furthermore questionable whether the ‘future market’ concept can capture innovation competition to its full extent, even in those merger cases in which it can generally be applied. However, the ‘Innovation Market Analysis’, the only tool especially designed to account for innovation competition so far, also has several shortcomings. Hence, at present there is no clear-cut approach which the antitrust agencies in the U.S. as well as in the E.U. could utilize as reference for an intervention aimed at the protection of innovation competition. The development of a revised approach for the assessment of potential anticompetitive innovation effects in merger reviews is therefore required. Nevertheless, the

‘IMA’ might still serve as a good starting point for the development of such a revised framework. Specifically, the framework should incorporate the concept of assessing relevant innovation competitors independently of their role on current product markets – a breakthrough idea that was introduced in the ‘IMA’.

2. Benjamin R. Kern & Juan Manuel Mantilla Contreras (2014): *Mergers and the Incentives to Undertake Product Innovation Oriented R&D: First Steps Towards an Assessment Approach*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.17-2014, available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/17-2014_kern.pdf.

(**Contributions:** Benjamin R. Kern: 60%, Juan Manuel Mantilla Contreras: 40%)

The second article builds on the results of the first article. Hereby the paper aims to develop the basic outlines for an assessment framework which could help competition authorities to deal with innovation effects of mergers and which could furthermore provide legal guidance. In addition, this contribution will specially cater for the implications which result from the separate consideration of innovation competition from actual product markets for the relationship between competition, concentration and innovation. These implications arise from the fact that the differentiation into product market competition on the one hand and innovation competition on the other, does not only have consequences for the identification of the relevant competitors, but is also crucial for assessing the anticompetitive effects of mergers on innovation.

Consider for instance a merger which takes place between firms that compete with one another only in terms of innovation (leaving product market competition unaffected). This would imply that only a fraction of the insights, provided by the vast array of theoretical models, matters in this concrete merger review. Hence, these types of mergers require focusing on different models in order to gain insights for the assessment of possible anticompetitive innovation effects, than a merger taking place between two firms that do also compete with one another on pre-innovation product markets. As a consequence, since mergers of firms that compete with one another in the sphere of innovation could leave product market concentration unaffected, it is very questionable whether the findings about the ambiguous interrelationship between product market competition and innovation can be transferred one-to-one to the assessment of those mergers.

Therefore, this paper analyzes the model-theoretic industrial organization literature and its findings about competition and the incentives to invest in product innovation oriented R&D against the background of this distinction into innovation competition on the one hand and product market competition on the other. For this purpose, we firstly reviewed the broad range of theoretical models, provided by the industrial organization literature. Hereby we particularly examined the underlying mechanisms of the models with respect to the question whether they rely on pre-innovation product market competition, or not. As a consequence, we received two distinct groups of potential innovation effects of mergers. The first group consists of effects which hinge on a change of current product market concentration, while the second group encompasses those kinds of effect which come into play even though pre-innovation product market competition is unaffected. Consequently, the effects of the first

group are only relevant, if pre-innovation product market structure is affected by a certain merger, while the effects of the second group have to be considered even in those situations in which mergers do only affect innovation competition.

Due to the fact that not every innovation effect is always relevant and since these innovation effects can furthermore have different impacts due to prevailing industry- and competition characteristics, it is helpful to assess the effects of mergers on innovation within certain case groups. However, in order to build these case groups, it is necessary to find the appropriate differentiation criteria. For this purpose, this article aims at identifying the relevant determinants, which are decisive for how a certain effect (*e.g.* the escape competition effect or the replacement effect) acts on the incentives to innovate. The identification and categorization of the innovation effects and relevant determinants thereby provides (1) a checklist of assessment criteria which antitrust authorities should take into account when analyzing innovation effects of mergers. (2) Besides this, this paper furthermore demonstrates how the development of such a decision theoretic assessment framework could be achieved. Such an assessment approach would allow combining the objective of a case-specific analysis with the requirement that this analysis is carried out in a consistent and transparent manner. It would therefore be in the spirit of a rule-based competition policy which is, from a law and economics perspective, ought to reduce error costs, give legal guidance and reduce legal uncertainty.

Apart from that, the paper aims to demonstrate that the link between competition and the incentives to undertake product innovation oriented R&D, which can be derived from the industrial organization literature, is not always that unclear as it seems on the first sight. Especially with respect to mergers between firms that compete with one another in terms of innovation, absent/detached from actual product markets, the relationship appears to be far less cloudy.

3. Benjamin R. Kern & Malte Ackermann (2014): *Shedding Some Light on the Dark Matter of Competition: Insights from the Strategic Management & Organizational Science Literature for the Consideration of Diversity Aspects in Merger Review*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.05-2014, available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/05-2014_ackermann.pdf.

(**Contributions:** Benjamin R. Kern: 80%, Malte Ackermann: 20%)

The third article then focuses on the question about the appropriate theory of harm behind the claimed negative effects of mergers on innovation. Traditionally, the discussion about anticompetitive innovation effects of mergers focused on the question whether a more or rather a less concentrated market structure (mostly narrowed to product market structure) is beneficial to innovation. However, until to date, theoretical as well as empirical contributions delivered rather contradictory results in the sense that they support the proposition that highly competitive just as much as more concentrated markets can basically spur innovation. Hence, from this perspective, it is not clear whether a merger, which leads to a higher market concentration, is detrimental or maybe even beneficial to innovation.

However, while mainstream economics focuses almost exclusively on the likely effects of a change of market structure on the firms' incentives to invest in R&D and their ability to

innovate, a change of the market structure can also have an additional effect on innovation. This effect originates from the fact that a merger, which causes a reduction of the number of innovation competitors, can also harm innovation because it reduces the variety of heterogeneous entities which are currently undertaking R&D or which are well situated to undertake R&D in a certain field. Assuming that companies differ not only with respect to their cost functions, but also in terms of their resources, organizational structure, corporate culture, as well as with respect to their expectations about promising areas of business and research projects, then the reduction of the number of competitors may already be detrimental to the overall innovativeness of an industry. Against this background, "diversity" can be considered as another dimension of the process of innovation competition - a dimension which, in addition to the firms' incentives and capabilities to innovate, might be worth protecting.

However, this property of competition is much less recognized in the respective antitrust literature. One explanation for this phenomenon might be the fact that mainstream economics and especially the modern industrial organization literature have fundamental difficulties to capture this dimension of competition, which Joseph Farrell therefore called vividly "the dark matter of competition". Apart from that it is also argued that, if "diversity" indeed has a noticeable effect on innovation, a merged entity should have an incentive to preserve such a fruitful environment in-house. Hence, a reduction of "diversity" among different firms ("inter-firm diversity") might get balanced by an increase of the diversity within the remaining firms ("intra-firm diversity") by itself. As a consequence, if one had to expect such an effect, antitrust authorities would have no reason to further consider this issue.

By assessing the management and organizational science literature, this first article aims to bring to light whether and how firms consider the preservation of "diversity", (1) either as a consequence of a newly created "intra-firm diversity", or (2) because of a direct maintenance of an acquired firm's autonomy, after a merger. For this purpose this contribution firstly investigates the "Corporate Entrepreneurship" (CE) literature which highlights the creation of independent subunits and spinoffs within a corporation. It is thereby demonstrated that the idea of a creation of independent entities in-house is indeed considered as an important determinant for the innovativeness and general performance of firms. However, it is also shown that firms, pursuing a CE strategy, will most likely face several grave implementation problems and trade-offs. The same holds true for a direct maintenance of "diversity" after a merger. Although the examined literature on post-merger integration presents strong arguments in favor of securing an acquired firm's independence and autonomy in order to keep its innovation capacity, it also indicates that there will emerge a trade-off between this objective and the realization of efficiency gains through integration.

Hence, on the one hand, the extensive management and organizational science literature suggests that considerations about the preservation of "diversity" in merger review might be exaggerated because firms should indeed have a strong incentive to preserve "diversity" in-house. On the other hand the analysis also shows that antitrust authorities cannot trust in the creation/maintenance of such an "intra-firm diversity" after a merger, since the merged entity will most likely face grave implementation problems and trade-offs.

4. Benjamin R. Kern, Ralf Dewenter, Wolfgang Kerber (2014): *Empirical Analysis of the Assessment of Innovation Effects in U.S. Merger Cases*, MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.50-2014 (2014), available at http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/50-2014_kerber.pdf.
(**Contributions:** Benjamin R. Kern: 70%, Ralf Dewenter: 15%, Wolfgang Kerber: 15%)

Whilst the first three articles focus on theoretical/conceptual questions, the forth article analyses empirically how the applied U.S. antitrust dealt with these issues in connection with the assessment of innovation effects in merger reviews. The decision to analyse the U.S. merger control practice stems from the fact that the U.S. authorities have examined a far greater number of mergers also towards innovation effects, than the European Commission.

In this respect the paper analyzes the "complaints" and "decision and orders" in the course of an exhaustive survey from all 399 mergers, challenged by the DOJ or FTC in the period between 1995 and 2008. By using probit techniques, the econometric study tackles the question of how and to what extent the U.S. agencies have assessed innovation effects of mergers. Additionally, it is also asked whether the two agencies have used the same or different approaches in regard to innovation effects of mergers, and whether we can observe developments during this period 1995 until 2008 in regard to these assessments. Important questions in that regard were (1) whether the U.S. authorities used predominantly a traditional assessment approach based upon the product market concept or whether they also used more innovation-specific assessment approaches, *e.g.* the "Innovation Market Analysis". (2) In addition, it is important what theory of harm was brought forward in connection with the claimed anticompetitive innovation effects.

Overall, the results about the practice of the assessment of innovation effects of mergers by the two U.S. antitrust authorities are very mixed and ambivalent. It is shown, that the agencies had innovation concerns in 135 mergers and that both agencies did consider for innovation effects in a third of all cases. However, on the basis of the 323 relevant markets with innovation aspects, the study also reveals that the two agencies did not have a clear and consistent assessment approach, and that both of them differed significantly also in regard to the question whether a more traditional product market approach should be used (mainly the DOJ) or whether a more innovation-specific approach should be applied, in which innovation is already considered in the market definition. A problematic outcome of our investigation is that in most cases the agencies gave no specific reasoning why the merger should lead to negative effects on innovation. Only in a minority of cases innovation incentive arguments and in some cases diversity arguments were mentioned. Another surprising and puzzling result is that the agencies increasingly have claimed simultaneously negative innovation and static price effects which can be interpreted as a sign of insecurity of the agencies, leading them to backing up their innovation concerns with more traditional and well-established claims about price effects. As a result, the article demonstrates that, on the one hand, assessing innovation effects is a well-established practice in U.S. merger policy, but, on the other hand, there are also a lot of inconsistencies and open conceptual questions in regard to the assessment approach, which also have not diminished over time.

5. Wolfgang Kerber / Benjamin R. Kern (2014): *Assessing Innovation Effects in US Merger Policy: Theory, Practice, Recent Discussions, and Perspectives*, Mimeo.
(**Contributions:** Benjamin R. Kern: 50%, Wolfgang Kerber: 50%)

The fifth and last paper of the dissertation builds mainly on the empirical results of the forth paper and aims to put the observations into a wider picture by also incorporating the findings of the three theoretical/conceptual articles. For this purpose, the paper starts with reviewing the rich theoretical and empirical literature on competition and innovation. Hereby the theoretical models and reasonings get examined against the background of the differentiation into models which rely solely on innovation competition and those which do also incorporate current product market competition, proposed in the second paper of this dissertation. This structured overview is followed by an investigation of the vast array of the empirical studies on industry structure and innovation, market structure and innovation, and mergers and innovation.

After introducing the existing assessment concepts for innovation effects of mergers, the empirical results of the forth article are introduced and subsequently assessed from a high-level competition policy perspective. Besides this, the article also provides a qualitative analysis of important merger cases after 2008 as well as an analysis of the U.S. Merger Policy under the Obama Administration and the reform discussion leading to the revision of the Horizontal Merger Guidelines in 2010. Hereby it is shown (1) that the cautious approach of assessing innovation effects has not changed under the Obama Administration, and (2) that despite the general consensus about the importance of innovation effects, the U.S. discussion is still very critical to more innovation-specific approaches in merger reviews.

This can also be seen in the revised U.S. Horizontal Merger Guidelines, which stick entirely to the traditional product market approach. In that respect, the guidelines also do not seem to reflect the already well-established practice of the U.S. antitrust agencies of using innovation-specific assessment approaches to a considerable extent. Instead, the results provided by the empirical analysis of the fourth paper of this dissertation offer good reasons to assume that this reluctance to consider innovation effects in the Guidelines lies to a large extent in the uncertainty about how competition authorities should assess the impact of a merger on innovation. This uncertainty appears to be the consequence of the disagreement about how competition authorities should grasp and assess the innovation effects of mergers properly.

Finally the article concludes by proposing different perspectives for future research. In this connection it is proposed to (1) base the theory of harm regarding mergers and innovation not exclusively on neoclassical economics, but to also include the evolutionary economics literature which is generally more suited to deal with dynamic innovation effects. (2) Besides this, future research should focus on the question of how the relevant innovation competitors should be identified most reliable. The first article of this dissertation showed that the "Innovation Market Analysis" started to ask the right questions about "overlapping R&D" and about the existence of "specialized assets", which can be interpreted as barriers to entry into innovation competition. (3) Last but not least, this paper establishes reference to the second article of this dissertation which already discussed the necessity of developing a structured investigation and assessment approach, capable of dealing with the problem that the innovation effects of mergers might be very different under different circumstances.

Essay I:

**Innovation Markets, Future Markets, or Potential Competition: How should
Competition Authorities account for Innovation Competition in Merger
Reviews?**

Beteiligte Autoren:

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Status:

Veröffentlicht in

WORLD COMPETITION: LAW AND ECONOMICS REVIEW, 37, 2, pp. 173-206 (2014)

Nominiert in der Kategorie “Mergers” im Rahmen der Antitrust Writing Awards 2015

zuvor Vorgestellt auf:

37. Hohenheimer Oberseminar 2011, Marburg

Essay I:

'Innovation Markets, Future Markets, or Potential Competition: How Should Competition Authorities Account for Innovation Competition in Merger Reviews?'

ist elektronisch erhältlich unter:

<http://www.kluwerlawonline.com/abstract.php?area=Journals&id=WOCO2014018>

Zitation:

Benjamin R. Kern, 'Innovation Markets, Future Markets, or Potential Competition: How Should Competition Authorities Account for Innovation Competition in Merger Reviews?' (2014) 37 *World Competition*, Issue 2, pp. 173–206

Essay II:

Mergers and the Incentives to Undertake Product Innovation Oriented R&D: First Steps Towards an Assessment Approach

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Status:

Working Paper

MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.17-2014 (2014)

Eingereicht:

**EUROPEAN JOURNAL OF LAW AND ECONOMICS
(abgelehnt und derzeit in Überarbeitung)**

Vorge stellt auf:

42. Hohenheimer Oberseminar 2014, Ilmenau

MERGERS AND THE INCENTIVES TO UNDERTAKE PRODUCT INNOVATION ORIENTED R&D: FIRST STEPS TOWARDS AN ASSESSMENT APPROACH

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ABSTRACT

The firms that compete with one another in terms of innovation do not necessarily coincide with the relevant competitors on pre-innovation product markets. As a consequence, the findings about the ambiguous interrelation between (product) market concentration and innovation cannot be transferred one-to-one to the interrelationship between innovation competition and innovation. By identifying and classifying the most relevant effects, which are decisive for the impact of mergers on the incentives to invest in product innovation oriented R&D, we will demonstrate that the interrelation between innovation competition and innovation is not always as unclear as it seems. Hence, by analyzing the model-theoretic industrial organization literature, this article aims to contribute to the discussion about the development of a decision theoretic assessment framework for analyzing the impact of mergers on innovation. It is therefore in the spirit of a rule-based competition policy which is, from a law and economics perspective, ought to reduce error costs, give legal guidance and reduce legal uncertainty.

JEL: K21; L12; L41; O31

I. INTRODUCTION

The outstanding relevance of innovation for economic growth and consumer welfare is relatively undisputed among lawyers and economists.¹ Therefore, it is only coherent that the 2010 U.S. ‘Horizontal Merger Guidelines’, in comparison to its predecessor, explicitly contain the objective of the protection of ‘innovation competition’ as well as the consideration for innovation related efficiency gains.² However, until today there is no adequate and widely accepted theoretical framework for the assessment of these aspects in merger review.³ Hence,

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¹ See Solow (1957); Denison (1985); Graham (1979).

² See U.S. Dep’t of Justice & Fed. Trade Comm’n, Horizontal Merger Guidelines (1992, rev. 1997); U.S. Dep’t of Justice & Fed. Trade Comm’n, Horizontal Merger Guidelines (2010), § 6.4.

³ See Kern (2014).

it is still not clear how antitrust agencies should actually comply with these objectives in a transparent and comprehensible manner.

The only framework that was designed particularly for the consideration of innovation effects so far was the ‘Innovation Market Analysis’ (IMA) of Richard Gilbert and Steven Sunshine.⁴ However, after the ‘IMA’ was introduced in 1995, it was heavily criticized by many scholars.⁵ In this connection it was argued that the ‘Innovation Market Analysis’ would rely on a general presumption of harm, in the sense that a higher concentrated ‘Innovation Market’ is generally unfavourable for innovation, although a stable interrelationship between ‘market structure’ and innovation was not identified.⁶ The latter argument was also central in the FTC’s recent decision to close the investigation of the *Genzyme/Novazyme* merger.⁷ In the course of this, Chairman Muris defended the decision against the dissenting statements of Commissioner Mozelle W. Thompson and Commissioner Pamela J. Harbour. Thereby, he relied on the findings of the ‘Global Marketplace Report’⁸, which revealed that there is no stable interrelation between ‘market concentration’ and innovation. Apart from ambiguous empirical observations⁹, the report relied particularly on the model-theoretic industrial organization literature which delivered very contradictory results, showing that very competitive as well as highly concentrated (product) markets can basically spur innovation (depending on the specific assumptions made in the corresponding models). However, it is remarkable that the discussion about competition, concentration and innovation did not fully account for the crucial implications, following from the separate consideration of innovation competition on the one hand and product market competition on the other. Since the competitors on product markets and the ones which compete with one another in the sphere of innovation do not necessarily coincide, the crucial novelty of the ‘IMA’ was that it aimed at identifying the relevant innovation competitors independently from their role on actual product markets.¹⁰ But, this distinction in innovation and product market competitors has, apart from its relevance for the identification of these competitors, also strong implications for the assessment of potential anticompetitive innovation effects of mergers. Consider for instance a merger which takes place between two firms that compete with one another only in

⁴ See Gilbert & Sunshine (1995a).

⁵ See Morse (2001), pp. 27; Hoerner (1995), pp. 49; Hay (1995), pp. 14; Rapp (1995), pp. 19; Gilbert & Sunshine (1995b), pp. 75; Landman (1999), pp. 728; Carlton & Gertner (2003), pp. 38; Davis (2003), pp. 680.

⁶ See Rapp (1995); Carlton & Gertner (2003); Davis (2003).

⁷ See Muris (2004), pp. 18; Thompson (2004); Harbour (2004).

⁸ See Federal Trade Commission, Office of Policy Planning (1996) [hereinafter GLOBAL MARKETPLACE REPORT], chapter 7, pp. 11.

⁹ For an excellent overview see Gilbert (2006), pp. 187.

¹⁰ See, Gilbert & Sunshine (1995a).

terms of innovation (leaving product market competition unaffected). This would imply that only a fraction of the insights, provided by the vast array of theoretical models, matters in this concrete merger review. Such a situation can, for example, occur when two research companies, which do only compete with one another in terms of innovation, merge. Another possible scenario, leading to such a situation, is that the firms are indeed producers of actual products, but they do not compete with one another on the same relevant product markets (pre-innovation product market competition is therefore not affected by the merger). Hence, these types of mergers require focusing on different models in order to gain insights for the assessment of possible anticompetitive innovation effects, than a merger taking place between two firms that do also compete with one another on pre-innovation product markets. As a consequence, since some mergers leave product market concentration unaffected, it is very questionable whether the findings about the ambiguous interrelationship between product market competition and innovation can be transferred one-to-one to the interrelation between innovation competition and innovation.

Therefore, this paper analyzes the model-theoretic industrial organization literature and its findings about competition and the incentives to invest in product innovation oriented R&D against the background of this distinction into innovation competition on the one hand and product market competition on the other. The decision to focus on product innovations was taken on the basis of the concerns about innovation effects, put forward in the applied merger reviews (in the U.S. as well as in the E.U.). Since, in both jurisdictions, explicit anticompetitive innovation effects were raised predominantly in connection with product innovations, we likewise focus on the effects of mergers on the incentives and abilities to undertake product innovation oriented R&D. For this purpose, we firstly reviewed the broad range of theoretical models, provided by the industrial organization literature. This step is carried out in analogy to the eminent works of Gilbert (2006)¹¹, and Schulz (2007)¹². However, in comparison to these previous works we did not systematize the literature primarily according to the underlying assumptions of the models (*e.g.*, whether the models rely on perfect IPRs or not). Instead, we tried to reveal the concrete underlying mechanisms, which determine the innovation incentives in each of the examined models. By clustering these mechanisms, we received several effects, which we consider as the major impact factors for the firms' innovation incentives. By doing this, our approach is close to the seminal work

¹¹ See Gilbert (2006).

¹² See Schulz (2007).

of Baker¹³, who also identified four important “principles” relating competition and innovation, which are particularly relevant for the assessment of innovation effects in antitrust. However, in comparison to Baker, we particularly examined the underlying mechanisms of the models with respect to the question whether they rely on pre-innovation product market competition, or not. As a consequence, we received two distinct groups of effects. The first group consists of effects which hinge on a change of current product market concentration. The second group encompasses those kinds of effect which come into play even though pre-innovation product market competition is unaffected. Consequently, the effects of the first group are only relevant, if pre-innovation product market structure is affected by a certain merger, while the effects of the second group have to be considered even in those situations in which mergers do only affect innovation competition.

However, since the changes in the firm’s innovation incentives, stemming from the effects of both groups, hinge again on several determinants (*e.g.* the type of pre- and post-innovation competition, or the regime of IPRs), we again analyzed the underlying mechanisms of the models behind each effect in detail. As a consequence, we received a set of determinants which are critical for how the identified effects act on the incentives to innovate within each of the two groups. Finally, we matched the identified effects with six case groups in which mergers, affecting innovation competition, can basically take place.¹⁴ Since not every effect is always relevant, and because of the fact that the determinants, which are decisive for the impact of a certain effect, can moreover differ from case to case, we analyzed the potential effects of a certain merger separately for each of these case groups.

Hence, we will demonstrate that the link between competition and the incentives to undertake product innovation oriented R&D, which can be derived from the industrial organization literature, is not always that unclear as it seems on the first sight. Especially with respect to mergers between firms that compete with one another in terms of innovation, absent/detached from actual product markets, the relationship appears to be far less cloudy. Besides this, we will also try to identify the most relevant effects, as well as the corresponding determinants, which have an impact on the incentives to invest in product innovation oriented R&D in a particular situation.

As a consequence, this article aims to contribute to the discussion about the development of an assessment framework for analyzing the innovation effects of mergers. It is therefore in the spirit of a rule-based competition policy which is, from a law and economics perspective,

¹³ See Baker (2007).

¹⁴ See Kern (2014), pp. 9.

ought to reduce error costs, give legal guidance and reduce legal uncertainty.¹⁵ The identification and categorization of effects thereby provides (1) a checklist of assessment criteria which antitrust authorities should account for when analyzing the impact of mergers on the firms' incentive to undertake product innovation oriented R&D and (2) these identified effects can furthermore serve as a starting point for the development of such a decision theoretic assessment framework.

The paper is structured as follows: In Section 2 we will give an overview on the most relevant innovation effects of mergers and assign them to the two different groups (effects which hinge on pre-innovation competition and those which do not). Thereby, we will also explain the economic theory behind the respective effects and introduce the relevant determinants which are decisive for how these effects influence the innovation incentives of the merging firms. Subsequently, in Chapter 3, we will evaluate the impact of a certain merger on the incentives to invest in product innovation oriented R&D. This assessment is carried out by explicitly considering for the influence of the relevant determinants on the introduced effects under different situations. In Section 4 we will then link the insights, gained in Chapter 2 and 3, to the six case groups developed by Kern (2014)¹⁶. Thereby we will analyze how the characteristics of a particular case group, in the sense of relevant effects and corresponding determinants, influence the assessment of the incentives to invest in product innovation oriented R&D. Conclusions follow in Section 5.

II. EFFECTS OF MERGERS WHICH INFLUENCE THE INCENTIVES TO INVEST IN PRODUCT INNOVATION ORIENTED R&D

Since the relevant competitors in terms of innovation do not necessarily coincide with the relevant competitors on product markets, it is possible that a particular merger has an impact on innovation competition, although product market competition is unaffected. Therefore, it is crucial to review the theoretical findings about competition and the incentives to innovate, provided by the industrial organization literature, and to analyze the corresponding theoretical models with respect to the question whether they rely on pre-innovation product market competition (group 1) or not (group 2).¹⁷ What is important for this approach is therefore the underlying mechanisms of the models which constitute the identified effects. Some of these effects are already well known because they are an integral part of the industrial organization

¹⁵ See Easterbrook (2006); Christiansen & Kerber (2006).

¹⁶ See Kern (2014), pp. 9.

¹⁷ This analysis is based to a large extent on the overview about the industrial organization literature, provided by the Master Thesis of Juan Manuel Mantilla Contreras; See Mantilla Contreras (2013).

literature. Famous examples are, for instance, the “replacement effect”¹⁸ or the “escape competition effect”¹⁹. Others, however, are less prominent. Hence, in the following we will give an overview on the most relevant effects, which belong either to group 1, or group 2, and discuss how they basically influence the firms’ incentives and abilities to innovate. By doing this, we will not only give reason for the allocation of the effects towards the two groups. Furthermore we will also identify the relevant determinants which are decisive for the impact of each effect on the firms’ innovation incentives. These determinants are derived from the assumptions made in the different models (*e.g.* assumption about the type and characteristics of pre- and post-innovation competition, or about the regime of IPRs). As a consequence, we will subsequently analyze how these determinants influence the functioning, and thus also the impact of each effect on the incentives to innovate, under different situations.

A. Effects which come into play when Pre-Innovation Product Market Competition is affected

Even though the identification of innovation competitors independently of the firms’ role on current product markets allows considering for innovation competition independently of pre-innovation product market competition (since the pre-innovation product market competitors cannot be equated to innovation competitors), pre-innovation product markets can still have an effect on the firms’ incentives to invest in product innovation oriented R&D. Thus, we want to find out: (1) what are the relevant effects which have to be assessed in the review of a merger of two innovation competitors that do also compete with one another on the respective pre-innovation product market? (2) When and how are they triggered by mergers and acquisitions?

1. Financial Base Effect

A very popular argument why product market concentration affects the incentives and abilities to innovate is that firms, which possess market power, can finance their R&D projects more easily due to higher profit margins. This argument, which goes back to Schumpeter²⁰, implies that firms, which operate under intense competition, generate merely little or even zero profits (in the extreme case of perfect competition), leaving no room for R&D investments. Hence, an increase in product market concentration might be beneficial to innovation in the sense that firms are enabled to undertake R&D in the first place. However,

¹⁸ See Arrow (1962).

¹⁹ See Aghion, et al. (2001); Aghion, et al. (2005); Bonanno & Haworth (1998); Boone (2001).

²⁰ See Schumpeter (1942); Evans & Hylton (2008).

critics also claimed that this argument has only limited relevance, because the firms, independent of their own financial base, have the alternative to finance their R&D investments by the capital market.²¹

Nevertheless, if we consider capital markets as being imperfect, a merger, which increases a firms' market power, can still be beneficial to innovation, because it improves the firms' financial base. However, this requires that the type of competition is not close to a Bertrand like price-competition. In this case, the merger would have only a very limited effect on the firms' profit margins. Similar considerations come into play if we consider the merging firms as competitors which indeed compete with one another on an actual product market, but with differentiated products. Hence, in analogy to the conventional assessment of static price effects, the diversion ratio, and thereby the question whether the products are close ore rather far substitutes, appears to be decisive.²²

2. *The Escape Competition Effect*

Closely linked to the last effect is the so called "escape competition effect".²³ Even though arguing from the opposite direction, the idea behind this effect is that very intense pre-innovation product market competition can also generate high innovation incentives, because the firms might wish to escape this competitive environment by inventing new products which create a new (less competitive) relevant product market.²⁴

How a certain merger will reduce this "escape competition effect" depends mainly on how competition intensity has to be characterized in a particular situation.²⁵ If the number of competitors is the decisive factor, a merger will, by eliminating a competitor, most likely reduce the incentives to invest in product innovation oriented R&D. If, however, competition is intense because of a Bertrand like price-competition, then mergers will probably not affect the "escape competition effect" (unless the merger leads to a monopoly).²⁶ The same holds true for situations in which the merging parties compete with one another with differentiated products, which can furthermore be characterized by a low diversion ratio.²⁷ Thus, in the case of differentiated products, the negative effect on innovation incentives via the "escape

²¹ See Modigliani & Miller (1958).

²² See Belleflamme & Vergari (2011).

²³ See Aghion, et al. (2001); Aghion, et al. (2005); Bonanno & Haworth (1998); Boone (2001); Belleflamme & Vergari (2011).

²⁴ See Aghion (2005).

²⁵ See Bonanno & Haworth (1998).

²⁶ See Delbono & Denicolo (1990).

²⁷ See Belleflamme & Vergari (2011).

competition effect” appears to be particularly relevant, whenever the merging parties are producers of close substitutes.

3. Pre-Innovation Market Size and Appropriability Effect

Another important effect which is also an inherent part of a vast amount of theoretical models, results from the size of a firm’s share of a certain pre-innovation product market. However, the role of the pre-innovation product market size for the incentives to innovate is twofold:

It has been shown that firms, which have a high market share, have stronger incentives to invest in process innovations.²⁸ This is due to the fact that process innovations, offering cost-cutting potentials, are particularly profitable whenever these cost-cuttings come into place in combination with a large output. Consequently, the incentives to undertake R&D towards process innovations are higher for firms which possess a relatively high market share, while the incentives to strive for product innovations are often assumed to be particularly prevalent for fringe firms, which have solely a small market share.²⁹ As a consequence, it can be assumed that an increase of the pre-innovation market share has a negative impact on the proportion of the overall R&D budget which is spend for product innovation oriented R&D.

Nevertheless, the firms’ share of a pre-innovation product market might still have a positive impact on the appropriability of profits, even if these profits stem from product innovations. As a consequence, in such situations, the incentives to invest in product innovation oriented R&D can improve, even though the distribution of the overall R&D budget actually changes at the expense of these kinds of R&D expenditures. However, those situations require that the pre-innovation product market share has a strong connection to the post-innovation product market share and this condition is, in contrast to process innovation oriented R&D, less stable. In regard to product innovations, a high market share on a pre-innovation product market has solely then a positive effect on the appropriability of innovation profits, as long as the pre-innovation product market share can be sufficiently transmitted to the post-innovation product market. In other words, a high market share on a pre-innovation product market has a positive effect on a firm’s incentives to invest in product innovations, as long as these innovations do not constitute an entirely new relevant product market. Otherwise it is rather the characteristics and the competition intensity of the post-innovation product market (which has only a limited or no connection to the current pre-innovation product market), which determines the incentives to innovate (“Schumpeterian

²⁸ See Bonanno & Haworth (1998); Boone (2000); Dutta, et al. (2005); Schmutzler (2010); Baker (1994); Yin & Zuscovitch (1998); Vives (2008).

²⁹ See Yin & Zuscovitch (1998).

Rents”)³⁰. This implies that the incentives to invest in product innovations (via the “pre-innovation market size and appropriability effect”) are only then positively influenced by the pre-innovation market share, when it comes to incremental product innovations.³¹ For radical product innovations, the pre-innovation market share has no positive effect (leaving the “financial base effect” aside). Moreover, as soon as we expect that firms can protect their innovations sufficiently by IPRs, granting them a temporal monopoly position, the role of pre-innovation market shares additionally loses relevance. Hence, the findings that a higher market share generates higher innovation incentives because of a better appropriability cannot be transferred one-to-one to product innovations.

Thus, how does a merger, which changes the firms’ market share on a pre-innovation product market, influence the firm’s incentives to invest in product innovations via the “pre-innovation market size and appropriability effect”? If competition authorities can expect that firms can protect their innovations sufficiently by IPRs (by gaining a monopoly position after introducing an innovation), there are no arguments why this effect should have a positive impact on the firms’ incentives to invest in product innovation oriented R&D. If IPRs are, however, considered as insufficient (*e.g.* because inventing around is expected to be quite likely), there might appear a positive impact regarding the incentives to invest in R&D towards the generation of incremental product innovations as a result of the augmented market share. Nevertheless, with respect to radical product innovations, the effect should again be negligible. There is, however, a general negative impact on the incentives to invest in product innovations, since the merged entity has an incentive to spend a higher fraction of the overall R&D budget on process innovations.

However, in analogy to the effects discussed before, also this effect loses its relevance, whenever the merger takes place between firms which compete with one another on pre-innovation markets by offering differentiated products which can be characterized by a low diversion ratio.

4. *Increase in the Extent of a Replacement Effect*

The idea of a “replacement effect” goes back to Kenneth Arrow.³² In this connection he assumed that firms, which possess market power on pre-innovation markets, have lower incentives to invest in R&D, because the benefits from an innovation will be devoured to a large extent by the loss of previous profits. In terms of product innovations this would apply

³⁰ See Rumelt (1987); Chen & Schwartz (2010); Aghion, et al. (2005).

³¹ See Greenstein & Ramey (1998); Shaked & Sutton (1982); Shaked & Sutton (1983).

³² See Arrow (1962); See also Reinganum (1989).

when a newly invented product replaces the old one by, in an extreme case, making it entirely obsolete. If, however, the degree of replacement is merely little (*e.g.* because the firm can still sell both the new and old product simultaneously to different types of consumers) then this effect becomes less important.

As a consequence, if the introduction of a new product is expected to have a significant replacement effect on existing products, a merger, which increases pre-innovation market power, will also increase the extent of the replacement effect. This is the case as long as the firms do not compete with one another in terms of a Bertrand like price-competition (pre-innovation profits and thus the extent of the replacement effect would be virtually unaffected) and, in the case of differentiated products, as long as the firms' products are close substitutes (otherwise the replacement effect will be less relevant).

However, it is not clear how the increase of the replacement effect will affect the firm's innovation incentives at the end of the day. It is possible that the merger will diminish the incentives to innovate because, due the increase in pre-innovation product market power (and thus pre-innovation profits), the firm has "less to win" after introducing a new product (the difference between pre-innovation and post-innovation profits declines). But, an increase in pre-innovation market power can also increase the firms' incentives to innovate because the firm has simultaneously "more to lose". This is the case, if another firm introduces a product innovation which has a replacement effect on the firm's current product. Hence, the increase in pre-innovation market power can also increase the firms' incentive to undertake R&D in order to defend its current market position.

Therefore, in order to determine whether the increase in pre-innovation market power in- or decreases the firm's innovation incentives via the replacement effect, it is decisive to find out whether the merged entity must fear that another firm could introduce a product which has a replacement effect on its current products (and profits), or not. It can be suggested that in analogy to the differentiation in the literature on potential competition there are two different types of the replacement threat.³³ Firstly, one can think of a replacement threat because the entity "observes" that another firm is already undertaking R&D towards the generation of a product which would replace its own products and profits. Apart from this "actual replacement threat" one can secondly think of a "perceived replacement threat". The idea behind this notion of the replacement effect is that even though the entity does not "observe" that another firm is already working on such a product innovation, there is still a reasonable risk that a replacement takes place. This risk hinges on the existence and relevance of entry

³³ See, *e.g.*, Areeda & Turner (1980).

barriers, necessary to undertake R&D towards product innovations which will have a replacement effect on the incumbent firm's products. As soon as these entry barriers are considered to be low, the firm's innovation incentives would increase as a consequence of the increase in pre-innovation market power.³⁴ However, whenever these entry barriers are considered to be high, the overall change of the innovation incentives via the "perceived replacement effect" will most likely be negative.

Therefore, what is crucial for assessing the overall direction of an increase in the extent of a replacement effect on the firms' incentives to innovate is (1) the investigation of the R&D projects which are already underway ("actual replacement threat") and (2) the existence and relevance of entry barriers for entering the process of innovation competition ("perceived replacement threat").

B. Effects which come into play even though Pre-Innovation Product Market Competition is unaffected

Besides the effects discussed within the previous section, there are also several effects which come into play because they are triggered by a change in innovation competition, even though pre-innovation product market structure is unaffected.

1. Entry Barriers & the Monopolization of Critical Assets Effect

The role of entry barriers is generally a decisive criterion for the assessment of innovation effects of mergers. This stems from the fact that already the identification of the relevant innovation competitors requires that the participation in the process of innovation competition prerequisites that the firms possess specific specialized assets.³⁵ Otherwise, if these entry barriers cannot be defined, innovation competition has to be understood as a process which is quite open. However, whenever R&D in a certain field indeed requires specialized resources, mergers can lead to a further agglomeration of these assets (*e.g.* patents or specially trained staff). This can additionally hamper, and/or create disincentives for, potential innovation competitors to enter the process of innovation competition.³⁶ This is particular critical in connection with the "perceived replacement threat effect", because it could allow the firm to shield itself from potential innovation competition. However, it has to be acknowledged that this is only problematic in the case of substitutive assets/resources. In the case of complementary assets, a merger can be beneficial for innovation because it might enable

³⁴ See Greenstein & Ramey (1998).

³⁵ See Gilbert Sunshine (1995a); Kern (2014).

³⁶ See De Bondt (1977); Vives (2008).

firms to innovate more efficient/rapidly.³⁷ These considerations should therefore be subject within the investigation of merger specific efficiency gains.

2. *Elimination of an Actual Replacement Threat Effect*

In the last section we have discussed how an increase in pre-innovation market power can influence the firms' incentives to innovate by augmenting the extent of the replacement effect. Even though the replacement effects generally requires that a link between pre-innovation product markets and product innovations exists, the replacement effect can still play an important role even though pre-innovation product market structure and thus the extent of the replacement effect is unaffected by the merger. This is the case when the target firm is actually the main source for a menacing replacement of the acquiring firm's products (*e.g.* because the target firm is the only firm currently undertaking R&D in this field or because other firms are way behind in the innovation process or lack crucial assets). Thus, even though pre-innovation product market structure is not affected by the merger, the replacement effect still plays an important role because the acquiring firm would practically eliminate the most relevant threat for its pre-innovation profits. As a consequence, even though also this feature of the replacement effect is closely linked to existing product markets, the "elimination of an actual replacement threat" affects the firms' incentives to innovate by avoiding that the replacement takes place, irrespective of the fact whether the target firm is an actual pre-innovation product market competitor, or not.

Therefore, what seems to be crucial for evaluating the "elimination of an actual replacement threat-effect" is to find out whether there are still enough other firms which are likewise planning to introduce a product innovation which is expected to have a replacement effect on the merging firms' products.³⁸ If this is not the case, it is again the relevance and existence of entry barriers which determines whether the elimination of an actual replacement threat has a negative impact. If entry barriers are high, the elimination will most likely have a negative effect on the firms' innovation incentives. Hence, the assessment of these determinants (actual replacement threat and perceived replacement threat) again seems to be decisive for assessing the effect of the loss of a potential innovator (threatening current product market profits) for the firms' incentives to innovate.

³⁷ See Cassiman, et al. (2005).

³⁸ See Gilbert (2006).

3. *Post-Innovation Product Market Competition and Appropriability Effect*

The relevance of the characteristics of post-innovation product markets and the degree of competition on these markets is usually discussed in connection with the expected innovation profits after the innovation is introduced (Schumpeterian Rents).³⁹ The “pre-innovation market size and appropriability effect”, introduced in the previous chapter, purposely captured only the effects, stemming from pre-innovation product market shares for the appropriability of innovation profits. Hence, the “post-innovation product market competition and appropriability effect” completes our considerations by accounting for the relevant innovation competition and its impact on post-innovation profits. Although the capability of the firms to appropriate their innovation profits was also decisive in connection with the “pre-innovation market size and appropriability effect”, this condition was exclusively affected by the firm’s pre-innovation market share. In comparison to these considerations, this effect directly accounts for the expected characteristics of post-innovation product market competition. Hence, in contrast to our considerations about pre-innovation product market competition, the decisive factor which determines the expected degree of competition on a post-innovation product market is not the distribution of current market shares and thus not the degree of current product market competition, but current innovation competition. What is crucial in this respect is therefore the innovator’s ability to exclude rivals from imitation, the number of firms which are likewise undertaking R&D and the size and characteristics of the post-innovation product market (including the expected type of competition on post-innovation markets, *e.g.*, Bertrand or Cournot, etc.). This becomes evident, if we consider that a large innovation reward will most likely attract many firms which likewise invest in R&D. As a consequence of this increase in innovation competition, the firms’ innovation efforts will most likely increase because each firm has an incentive to be the first to invent, either in order to file a patent or due to possible first mover advantages (stimulus effect).⁴⁰ But, whenever the firms can protect their innovations only insufficiently by IPRs, too much competition might also lead to a decrease of the incentives to invest in R&D, because the profits of an innovation have to be shared with too many competitors (market room factor).⁴¹ In an extreme case, the whole R&D process might even break down, because the profits, which each single firm can capture, are so little that the R&D cost cannot be recouped.⁴² However, what should have become clear is that post-innovation product market competition hinges on today’s intensity

³⁹ See Loury (1979); Dasgupta & Stiglitz (1980); Aghion, et al. (2005); Lee & Wilde (1980).

⁴⁰ See Scherer & Ross (1990); Kamien & Schwartz (1976); Fudenberg, et al. (1983).

⁴¹ *Ibid.*

⁴² See Scherer & Ross (1990).

of innovation competition and not necessarily on today's pre-innovation product market competition.

If the firms are, however, able to protect their innovations sufficiently by IPRs, this aspect becomes less relevant.⁴³ Even though the patent race literature indeed suggests that the R&D expenditures per firm will decline as the number of competitors increases (because the probability that another firm wins the race is augmented), the aggregated R&D expenditures are still higher under intense competition and the probability that an innovation is achieved earlier is augmented.⁴⁴ Hence, a crucial factor for the analysis of the “post-innovation product market competition and appropriability effect” is whether the firms can protect their innovations sufficiently by IPRs, or not. If IPRs are insufficient, competition authorities have to balance the “stimulus factor” against the “market room factor” in order to estimate the overall impact of this effect on the innovation incentives.

Nevertheless, there is another theoretical argument why mergers between two innovation competitors might not have a negative (or maybe even a positive) effect on the firms' incentives to innovate. This argument hinges on asymmetries between the competitors progresses regarding their attempt to achieve a certain innovation. In particular, the asymmetries among the research projects might have strong implications for the incentives to innovate if, for instance, the distance in progress between the firms' R&D programs is so large, that the laggard firm is close to give up and stop its R&D efforts.⁴⁵ Under such a setting (a leading firm and a laggard firm merge), a merger will most likely not diminish the firms' incentives to undertake product innovation oriented R&D. In the case that two laggard firms merge, this event might even increase the firms' incentives, if the merger allows them to catch up with the leader. If, however, the distance among the research projects is short and competition is intense, a merger will affect the firms' innovation incentives as described before in connection with the “post-innovation product market competition and appropriability effect”.

Besides the fact that differences the firms' R&D programs matter, it is also important to consider for the circumstance whether the laggard firm can be expected to catch up with the leader via leapfrogging.⁴⁶ If an innovation is expected to require knowledge accumulation or a certain “stock of knowledge”,⁴⁷ leapfrogging is less likely to occur and the distance between

⁴³ See Reinganum (1989).

⁴⁴ See Loury (1979); Dasgupta & Stiglitz (1980).

⁴⁵ See Fudenberg, et al. (1983); Harris & Vickers (1987); Lippman & McCardle (1987); Grossman & Shapiro (1987); Doraszelski (2003).

⁴⁶ See Vickers (1986); Harris & Vickers (1987); Harris & Vickers (1985).

⁴⁷ See Fudenberg, et al. (1983); Doraszelski (2003).

the firms' R&D programs matters as described in the last paragraph. But, whenever leapfrogging is deemed as possible (either because an innovation is not expected to require knowledge accumulation/a certain stock of knowledge, or because it can be expected that knowledge can easily be acquired and adopted), even the acquisition of a laggard firm could be anticompetitive.

4. Internalization of Spillovers Effect

The argument about an increase of innovation incentives due to an internalization of R&D spillovers was most prominently captured by d'Aspremont and Jacquemin.⁴⁸ Hereby the authors showed that the existence of these spillovers can lead to an underinvestment in R&D because an extensive part of the knowledge, generated by the entity which undertakes the R&D efforts, drains off and has to be shared with the firm's competitors. As a consequence, a positive side effect of the merger might be the internalization of such spillovers, leading to an increase of innovation incentives.

III. EVALUATION OF THE EFFECTS OF MERGERS ON THE INCENTIVES TO INVEST IN PRODUCT INNOVATION ORIENTED R&D

The previous chapter represents a synopsis of the most relevant effects of mergers on the incentives to undertake product innovation oriented R&D, provided by the industrial organization literature. But, how do the identified effects work under different situations? In the assessment above we have seen that the changes of the firms' innovation incentives, stemming from the effects of both groups, hinge again on several determinants (*e.g.* the type of pre- and post-innovation competition, or the regime of IPRs). As a consequence, by looking through the introduced effects, we receive a set of determinants which are decisive for analyzing the impact of each of the identified effects on the incentives to innovate.

For the effects of the first group (effects which stem from a change in pre-innovation product market competition) these decisive determinants were:

- The type of pre-innovation product market competition (Bertrand, Cournot, etc.)
- The relevance of IPRs as well as the differentiation of product innovations into radical (in the sense that a new product market is created) and incremental product innovations
- The existence of an "actual replacement threat" as well as the existence and relevance of entry barriers for a "perceived replacement threat"

⁴⁸ See D'Aspremont & Jacquemin (1988).

For the effects of the second group (effects which do not stem from a change in pre-innovation product market competition) the decisive determinants were:

- The distinction between a complete and incomplete elimination of an “actual replacement treat” and the existence and relevance of entry barriers for a “perceived replacement threat”
- The relevance of IPRs, and, in the case of insufficient IPRs, the type of post-innovation product market competition (Bertrand, Cournot, etc)
- The distinction between situations in which leapfrogging is expected to be likely or unlikely and, in the latter case, the differentiation into “neck and neck”, “leader and laggard” and “laggard and laggard” innovation competitors

An overview on the effects of each of the two groups, as well as the corresponding relevant determinants, can be found in table 1 (for group 1) and table 2 (for group 2). The effects of table 2 have to be considered in any case in which the merging parties are considered as innovation competitors, while the effects of table 1 do only play a role when the merging parties do also compete with one another on the respective pre-innovation product markets. In both tables the relevant effects are listed on the y-axis. The determinants, which characterize either the type of current pre-innovation product market competition (table 1), or the type of post-innovation product market competition (table 2), are listed on the x-axis.

Besides this, the two tables also provide a first evaluation of how a certain merger will, *ceteris paribus*, affect the innovation incentives of the merging parties via the identified effects under different situations (characterized by the respective determinants introduced above). In this connection we differentiated between three basic directions of how a certain effect can affect the innovation incentives of the merging parties; (1) Either the impact of the effect is approaching zero ($\rightarrow 0$), (2) the effect is expected to be positive (+), or (3) the effect is expected to be negative (-). However, since the evaluation of the effects is carried out in a *ceteris paribus* analysis, which implies that each effect is evaluated isolated (holding all the other effects constant), the following tables provide solely a rough guidance.

Table 1: How does a merger between two innovation competitors change the merging firms' incentives to undertake product innovation oriented R&D (caused by mergers which also affect Pre-Innovation Product Market Competition)?

Type of Pre-Innovation Product Market Competition Effects	homogeneous products		differentiated products	
	competition in price	competition in quantity	close substitutes	far substitutes
Financial Base Effect	→0	+	+	→0
Escape Competition Effect	→0	-	-	→0
Pre-Innovation Market Size and Appropriability Effect				
- Perfect IPRs	→0/-	→0/-	→0/-	→0/-
- Imperfect IPRs (radical)	→0/-	→0/-	→0/-	→0/-
- Imperfect IPRs (incremental)	+/-	+/-	+/-	+/-
Increase in the Extent of a Replacement Effect				
- No Actual Replacement Threat and High Entry Barriers	→0	-	-	→0
- Actual Replacement threat and/or Low Entry Barriers	→0	+	+	→0

“→0” stands for: *is approaching zero*; “-” stands for: *negative impact*; “+” stands for: *positive impact*

Source: Authors

The “financial base effect” has either a positive impact on the firms' innovation incentives or its impact is approaching zero. This stems from the fact that a merger of two innovation competitors which do also compete with one another on pre-innovation product markets will increase the firms' pre-innovation market power and thus also their profits, as long as the firms' products are relatively close substitutes and the competition on this market is not characterized by a Bertrand like price competition. Hence, the firms' financial base improves and the ability to invest in R&D will increase.

The same (although with inverted sign) holds true for the “escape competition effect”. Once the merger increases the firms' profits on a pre-innovation product market, the necessity

to escape the current product market competition is reduced and the impact on the firms' incentives to undertake product innovation oriented R&D is therefore negative.

The "pre-innovation market size and appropriability effect" has generally either a negative impact on the firms' incentives to invest in product innovation oriented R&D, or its impact is approaching zero. This stems from the fact that the pre-innovation product market share of the acquiring firm will increase due to the transaction. As a consequence of this increase in market share, the incentives to invest in process innovation oriented R&D are augmented. This can result in a shift of financial resources away from product innovation oriented R&D towards process innovation oriented R&D. The only possible impact of the "pre-innovation market size and appropriability effect" might occur with respect to the incentives to undertake R&D towards the development of incremental product innovations. In this connection an increase of the firm's market share can increase the incentives to invest in product innovation oriented R&D, despite an eventual reallocation of the firm's R&D budget.

The last effect which has to be considered within this first group is the "increase in the extent of a replacement effect". In analogy to the "financial base effect" and the "escape competition effect" the innovation incentives are only affected by the merger if it leads to increasing profits on the pre-innovation product market (as long as the firms' products are relatively close substitutes and competition on this market is not characterized by a Bertrand like price competition). In dependence of the existence of an "actual" or a "perceived replacement threat", the effect has either a positive or a negative impact on the firms' innovation incentives. If an "actual replacement threat" exists and/or the entry barriers are considered to be low, the increase in profits on the pre-innovation product market leads to increased innovation incentives. This happens because the firm has "more to lose" after the merger. However, in a scenario of a missing "actual replacement threat" and high entry barriers, the firm would be well protected against a potential replacement but would simultaneously have "less to win" after the merger. This is the case because the profits, which can additionally be earned as a consequence of the introduction of a new product, are lower than before the merger.

Table 2: How does a merger between two innovation competitors change the merging firms' incentives to undertake product innovation oriented R&D (caused by mergers which do not necessarily affect Pre-Innovation Product Market Competition)?

Type of Post-Innovation Product Market Competition Effects	perfect IPRs	imperfect IPRs			
		homogeneous products		differentiated products	
		competition in price	competition in quantity	close substitutes	far substitutes
Entry Barriers & the Monopolization of Critical Assets Effect	-	-	-	-	-
Elimination of an Actual Replacement Threat Effect					
- Complete Elimination of the Actual Replacement Threat and High Entry Barriers	-	-	-	-	-
- Incomplete Elimination of the Actual Replacement threat and/or Low Entry Barriers	→0	→0	→0	→0	→0
Post-Innovation Competition and Appropriability Effect					
- Leapfrogging is Expected to be Likely	-	→0	+/-	+/-	→0
- Leapfrogging is Expected to be Unlikely (neck and neck)	-	→0	+/-	+/-	→0
- Leapfrogging is Expected to be Unlikely (leader & laggard)	→0	→0	→0	→0	→0
- Leapfrogging is Expected to be Unlikely (laggard & laggard)	→0/+	→0/+	→0/+	→0/+	→0/+
Internalization of Spillovers Effect	+	+	+	+	+

“→0” stands for *is approaching zero*; “-” stands for *negative impact*; “+” stands for *positive impact*

Source: Authors

Once competition in innovation is considered as a process which requires critical specialized assets, the acquisition and monopolization of such (substitutive) assets will most likely have a negative impact on the firm's incentives to innovate. This stems from the fact that this monopolization shields the firm from potential innovation competition which, absent the merger, could *e.g.* lead to a replacement of current products.

The evaluation of the “elimination of an actual replacement threat effect” hinges on the fact whether the merger sufficiently eliminates the menacing replacement threat or not. If the

acquirer assimilates the only firm which represents a serious source for a replacement threat and entry barriers are furthermore high, than the effect will have a negative impact on the firm's innovation incentives. If the merger, however, leads either only to an incomplete elimination of the actual replacement threat or the elimination is complete but entry barriers are very low, than the impact will most likely be approaching zero.

The evaluation of the impact of the "post-innovation product market competition and appropriability effect" is probably the most complex one. This stems from the fact that its impact on the firms' incentives hinges on several determinants. Since intense innovation competition can create high innovation incentives (because each firm has an incentive to innovate first), but too much innovation competition can also cause appropriability problems, a merger can lead to both, an in- or a decrease of innovation incentives. A crucial factor which determines whether the effect goes in the one or the other direction is the distinction into situations in which IPRs allow only for an insufficient protection of an introduced innovation, and those situations in which an innovation is well protected by intellectual property rights. But, under insufficient IPRs, the impact of the effect is furthermore determined by the expected type of post-innovation product market competition. The appropriability, and thus the innovation incentives, will *e.g.* not change significantly, if the future products of the merging parties were expected to be solely far substitutes or to compete with one another in a Bertrand like price competition. If these products are, however, expected to be relatively close substitutes, the incentives can increase, if the positive influence of a change in the "market room factor" overcompensates the negative influence of a change in the "stimulus factor". Nevertheless, besides the characteristics of IPRs and the type of post-innovation product market competition, it is also decisive whether leapfrogging is expected to be possible and, if this is not the case, whether the merging firms are neck-and-neck innovation competitors. The previous considerations about the impact of this effect hold only true, if at least one of these two properties is fulfilled. Otherwise, the merger will most likely not affect the firms' innovation incentives (*e.g.* in the case of a leader and a laggard competitor which was close to giving up) and, in the case of a merger between two laggard competitors, the merger can even increase the firms' innovation incentives because it prevents them from dropping out of the competition process.

The last effect which has to be assessed is the possibility that knowledge spillovers get internalized. Hence, whenever significant spillover effects between the merging firms existed before the merger, the internalization of these spillovers will most likely increase the firms' innovation incentives.

IV. ASSESSING THE INCENTIVES TO INVEST IN PRODUCT INNOVATION ORIENTED R&D WITHIN SIX DISTINCT CASE GROUPS

A. Six Case Groups of Innovation Competition Mergers

Since not every effect is always relevant and because of the fact that the determinants, which are decisive for the impact of a certain effect, can differ from merger case to merger case, the first step towards the development of an assessment framework is to identify groups of merger cases which share the same properties. Consequently, each of these case groups encompasses those kinds of merger cases which require the assessment of similar effects and determinants. Thus, the review process varies from case group to case group, but remains consistent and uniform within each case group. As a consequence, such an approach allows to combine the objective of accounting for the specific characteristics of each merger case with the requirement that this assessment is carried out in a consistent and transparent manner.

As it was shown in Kern (2014)⁴⁹, there can basically emerge six distinct scenarios in which a merger, which affects innovation competition, can take place from an antitrust authority's perspective. In this connection it was proposed to differentiate between mergers in which the relevant innovation competitors correspond to the relevant competitors on the respective pre-innovation product markets and (2) those kind of mergers in which innovation competition takes place detached/absent from pre-innovation product market competition. Therefore, the firms which are involved in a merger (which raises anticompetitive concerns with respect to innovation) can, but do not necessarily have to, be pre-innovation product market competitors. Beside this, it was suggested to account for the fact whether antitrust authorities can "observe" the R&D projects of the merging parties and their competitors (*e.g.* because of FDA approval procedures in pharmaceutical mergers)⁵⁰, or whether the authorities have difficulties in doing so. In the latter case, antitrust authorities have to rely on "specialized assets" which are deemed as indispensable for undertaking R&D in a certain field of research.⁵¹ As a consequence, besides the distinction in mergers which affect pre-innovation product market competition and those which exclusively affect innovation competition, is it further necessary to differentiate between mergers (1) in which R&D is "observable" and those (2) in which the agencies have to rely on the "specialized assets". Nevertheless, in the case of "observable" R&D projects it is moreover important to distinguish between R&D projects which are expected to create an entirely new product market (close to the idea of radical/drastic innovations) and those, which will most likely

⁴⁹ See Kern (2014), pp. 9.

⁵⁰ See Carrier (2008), pp. 401.

⁵¹ See Gilbert & Sunshine (1995a).

result in a product which still belongs to an already existing product market (close to the idea of incremental innovations). Thus, the subcategory of “observable” R&D has to be further refined into “observable” R&D which constitutes a new product market and “observable” R&D which does not constitute a new market. This distinction leads to the following six Case Groups:

Table 3. Overview on Six Case Groups of Innovation Competition Mergers

	The Merging Firms are Pre-Innovation Product Market Competitors	The Merging Firms are <u>not</u> Pre-Innovation Product Market Competitors
Identification by required Specialized Assets	(1)	(2)
“Observable” R&D Projects which create a New Relevant Product Market	(3)	(4)
“Observable” R&D Projects which do <u>not</u> create a New Relevant Product Market	(5)	(6)

Source: Kern (2014).

It is evident that in some merger cases competition authorities have to account for the whole range of identified effects, because the merger will alter both, pre-innovation product market structure and the competitive structure regarding innovation competition (*i.e.* in case group 1, 3, and 5). This stems from the fact that in these mergers the innovation competitors do also compete with one another on the respective pre-innovation product market. As a consequence, such a merger will alter both, pre-innovation product market structure as well as the competitive structure with respect to innovation competition. Therefore, also the incentives to innovate will be affected by both changes.

In other merger cases, however, only a limited number of the introduced effects appear to be relevant. This is particular true for those kinds of mergers in which current pre-innovation product market structure is unaffected by a merger (*i.e.* case group 2, 4, and 6). Hence, in contrast to case group 1, 3, and 5, mergers between firms which compete with one another only in regard to innovation do not change the actual pre-innovation product market structure. Thus, the incentives and abilities to innovate, stemming from the nature and characteristics of pre-innovation product market competition, are not affected by such kind of mergers. As a consequence, many insights regarding the firms’ incentives and abilities to invest in R&D,

provided by models which rely on mechanisms, rooted in pre-innovation product market competition, do not hold anymore in such a situation.

B. Assessing the Innovation Incentive Effects of Mergers within the Six Case Groups

1. The Merger Affects Innovation Competition as well as Pre-Innovation Product Market Competition and the Firms are identifiable by the required Specialized Assets

This first case group is probably the fuzziest and most ambiguous one, making it very difficult to assess. This stems from the fact that the R&D projects, in these merger cases, cannot be “observed” and pre-innovation product market competition as well as innovation competition is affected. Hence, a merger which takes place in such an environment will influence the firms’ innovation incentives via both channels. As a consequence, competition authorities have to analyze each of the introduced effects carefully in order to come to a satisfactory assessment.

In regard to the effects, stemming from a decrease in pre-innovation product market competition, it has to be assessed whether:

- The financial base of the merging parties improves and whether this will have a significant effect on the firms’ capability to invest in R&D, or whether this increase will only play a minor role for financing R&D, because of an already high financial base (due to a large firm size or substantial market power on other markets).
- The incentives to escape the respective pre-innovation product market are reduced by the merger and whether this reduction is substantial, or whether there are still enough competitors left who ensure that the competitive pressure on the actual pre-innovation product market is upheld.
- The incentives to invest in product innovation oriented R&D are reduced due to an increase of the pre-innovation market share and a consequential reallocation of the R&D budget away from product oriented - towards process oriented R&D, or whether these incentives are expected to increase in the case of imperfect IPRs in combination with incremental product innovations. As a consequence of the fact that R&D projects can hardly be “observed” in this case group, this differentiation between radical and incremental product innovations will probably be difficult to assess. Hence, in these merger cases it will be very challenging to reveal the overall impact of this effect.
- A replacement effect is likely to occur and if so, whether the merger augments its extent. In order to find out whether the merger will rather in- or decrease the firms’ innovation incentives via this effect, competition authorities have to assess whether an “actual”

and/or “perceived replacement threat” exists. This requires analyzing the current and “observable” research projects of the merged entity’s innovation competitors as well as the existence and relevance of entry barriers. Since this case group is characterized by R&D projects which can hardly be “observed”, the investigation of the replacement effect has to be carried out predominantly by analyzing the entry barriers in the sense of specialized assets which are necessary to undertake R&D towards product innovations which will have a replacement effect on the firms’ products. If these entry barriers are low, the increase in market power will most likely lead to an increase of innovation incentives, because after the merger the firm has “more to lose”. However, the incentives will rather decline, if the entry barriers are high. This stems from the fact that the merged entity has firstly “less to win” and secondly because the perceived threat, that a replacement takes place, is low.

In regard to the effects, which do not hinge on pre-innovation product markets, it has to be assessed whether:

- The merger leads to a monopolization of critical specialized assets (*e.g.* patents) which are decisive for taking part in the process of innovation competition.
- The merger will lead to an elimination of an actual replacement threat and if so, whether there are still enough competitors left, which ensure that the competitive pressure is upheld. This assessment is again quite difficult due to the fact that the R&D projects can hardly be “observed”. Instead, it is again helpful to assess the existence and relevance of entry barriers in the sense of specialized assets which are necessary to undertake R&D towards product innovations which will have a replacement effect on the incumbent firms’ products.
- The incentives to innovate are changed via the “post-innovation product market competition and appropriability effect”. In this connection it is first of all crucial to find out whether innovation profits can be appropriated due to the existence of strong IPRs, or whether IPRs have to be considered as imperfect and insufficient. In the latter case, it is furthermore important to get an impression of the post-innovation product market characteristics and the expected type of competition. On this basis, competition authorities have to assess whether the reduced “stimulus effect” or rather the improved “market room factor” has a stronger impact on the firm’s innovation incentives. Apart from that, it is also important to investigate whether one of the competitors is way ahead in the innovation process, or not. However, since the possibility to “observe” whether one

firm is ahead, or not, is not provided in these kinds of merger cases, the influence of distance on the innovation incentives will most likely play a minor role in the corresponding assessment.

- The merger between two innovation competitors is expected to lead to a noticeable internalization of R&D spillovers. If this is the case, the merger might have a positive impact on the firms' innovation incentives due to the internalization of these spillovers.

Prominent merger cases which fall into this case group are, for instance, the proposed mergers of GM and ZF⁵² or Lockheed Martin and Northrop Grumman⁵³, as well as the merger of Halliburton and Dresser.⁵⁴

2. *The Merger affects only Innovation Competition and the Firms are identifiable by the required Specialized Assets*

In comparison to case group 1, the analysis of effects stemming from pre-innovation product markets is no longer a part of the anticompetitive assessment. The assessment of the effects, which do not hinge on pre-innovation product markets, should be carried out in analogy to case group 1.

3. *The Merger affects Innovation Competition as well as Pre-Innovation Product Market Competition and R&D Projects are furthermore “Observable” (expected to create a New Relevant Product Market)*

How does the assessment change for mergers falling into case group 3, in comparison to those of case group 1? Since the merger will still alter both pre-innovation product market structure and innovation competition, antitrust authorities still have to account for the whole set of effects as they were described in line with the assessment of case group 1. However, there are some remarkable differences. These differences stem from the fact that, in this case group, antitrust authorities can “observe” the R&D projects of the firms. The ability to “observe” the respective R&D projects results, in most cases, from lengthy regulatory approval procedures (like in the case of pharmaceuticals)⁵⁵, which function as entry barriers for future goods markets. As a consequence, antitrust authorities can get quite a good impression of which products might make it to the market within the next couple of years. However, not only the antitrust authorities can “observe” these projects, but also all the other firms. Besides this,

⁵² See, United States v. General Motors Corp., Civ. No. 93-530 (complaint filed D.Del. Nov. 16, 1993).

⁵³ See United States v. Lockheed Martin Corp., Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998).

⁵⁴ See United States v. Halliburton Co., Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998).

⁵⁵ See Carrier (2008).

there seems to be a high correlation between the industries which can be characterized by these regulatory approval procedures, and the industries in which the relevance of IPRs for appropriating innovation profits is particularly high.⁵⁶ Furthermore, the competitive assessment of mergers, which fall into case group 3, deals with research projects which are expected to constitute a new relevant product market. Hence, we will only consider for the effects regarding radical product innovations, leaving incremental product innovations aside.

In regard to the effects, stemming from a decrease in pre-innovation product market competition, these properties of case group 3 have the following effects for the competitive assessment (in comparison to case group 1):

- The “pre-innovation market size and appropriability effect” will now have a neutral or negative impact. This stems from the fact that the relevance of IPRs, regarding a merger which falls into case group 3, is expected to be high. Furthermore, this case group encompasses mergers in which the emergence of a new product market is at stake. As a consequence, neither current market shares nor current market power will improve the firms’ ability to appropriate their innovation profits. However, the increased market share of the merged entity can lead to a reallocation of the R&D budget towards process innovation oriented R&D, leaving less financial resources to strive for product innovations.
- There is also a high likelihood that the “increase in the extent of a replacement effect” will have a negative impact. This stems from the circumstance that the high relevance of IPRs and experience in these industries often constitute high entry barriers for entering the process of innovation competition. Besides this, the regulatory approval procedures, which are expected to play an important role in this case group, do not allow for an unexpected and fast introduction of a new product. As a consequence, the merged firm will get a pretty good impression of whether and when a competitor might introduce a new product, which would threaten its current profits. Hence, the idea of a balance between having “less to win” and simultaneously also “more to lose” seems to shift towards the “less to win” side. This stems from the fact that the likelihood that these greater losses become reality gets easier to estimate and calculate. Such a behavior is also in line with a so called “fast second strategy”⁵⁷ which implies that dominant firms are rather reluctant with respect to investing in R&D unless they are challenged. Only after realizing this threat, they start to vigorously fight back.

⁵⁶ See Cohen, et al. (2000); Peneder (2010).

⁵⁷ See Scherer & Ross (1990).

However, under the existence of an “actual replacement threat” one can also think of increasing innovation incentives. This is the case when there is at least one firm which already works seriously on an innovation which could have a replacement effect on the firm’s products. In comparison to the exclusive analysis of entry barriers in line with case group 1, the ability to “observe” R&D projects now allows to directly identify the firms which currently undertake R&D towards product innovations which could, if carried out successfully, replace current products. If there is indeed at least one firm which is already seriously undertaking R&D, the innovation incentives of the merged entity would increase because the firm has “more to lose”, even though the assessment reveals that entry barriers are high.

- Apart from these changes, the assessment of effects stemming from pre-innovation product markets should be carried out in analogy to the corresponding assessment of case group 1.

In regard to the effects, which do not hinge on pre-innovation product markets, the properties of case group 3 have the following effects for the competitive assessment (in comparison to case group 1):

- As already discussed in line with the “increase in the extent of a replacement effect”, the ability to “observe” R&D projects allows for a direct assessment of the products which are currently in the R&D pipelines. This has also strong implications for the assessment of the “elimination of an actual replacement threat effect”. First, it is crucial to assess whether a certain merger would lead to the elimination of a concrete replacement threat and if so, whether there are still enough competitors left which ensure that the replacement threat is upheld. In comparison to case group 1, this analysis becomes feasible thanks to the ability to “observe” the firms’ R&D projects. What is also new in case group 3 is the significance of IPRs (*e.g.* patent protection) for current and future product markets. Whenever existing products are protected by IPRs, the elimination of an actual replacement threat can be particularly critical. This stems from the fact that a patent provides a temporal and legally granted monopoly position, leading to the greatest replacement effect possible. Therefore, in the case that no serious threat exists, the merged firm would have a strong incentive to delay the introduction of a new product until the patent of the existing product (and thus the temporal monopoly) expires.
- Since IPRs can be expected to play an important role in the industries whose mergers often fall into this case group, also the “post-innovation product market competition and

appropriability effect” will most likely have a negative impact because of the diminished “stimulus factor”. However, whenever IPRs are nevertheless insufficient, it has to be assessed whether the expected type of post-innovation product market competition can be characterized rather by competition in price or quantity, whether the R&D projects of the merging parties are expected to result in relatively homogeneous or rather differentiated products, and in the case of differentiated products, whether the products are expected to be rather close or far substitutes. In dependence of the outcome of this analysis it is possible that a positive impact because of the “market room factor” exists. However, even in those cases where one could think of such a positive influence, there still remains the negative impact because of the “stimulus factor”. Hence, these two opposing “factors” have to be balanced against each other.

However, since the assessment of innovation effects of mergers should be triggered exclusively once the process of innovation competition is already highly concentrated and can furthermore be characterized by high entry barriers, it is very questionable whether the positive effect of the “market room factor” will have a strong impact on the outcome of the subsequent analysis. These doubts are further intensified since this case group deals with existing R&D projects which are already underway. This implies that the firms expected them to be profitable. Hence, even if the merger does not take place there is apparently enough “room” in the post-innovation market, given the number of competing R&D programs.

- However, what could relax the anticompetitive doubts is the analysis of the distance between the merging firms’ R&D projects. Whenever R&D is expected to be cumulative, innovation competitors can be characterized as either “neck and neck”, or “leader and laggard” competitors (or even “laggard and laggard” competitors). This differentiation is again possible due to the ability to “observe” the firms’ R&D projects. Hence, whenever leapfrogging can be excluded, serious doubts will mainly arise in situations in which the competitive situation between the merging firms can be characterized as being close to “neck and neck”. Whenever a leader and a laggard competitor merge, this situation might be less problematic (in the case of a merger of two laggards, the impact might even be positive).
- Apart from these changes, the assessment of the effects, which do not hinge on pre-innovation product markets, should be carried out in analogy to the corresponding assessment of case group 1.

4. *The Merger affects only Innovation Competition and R&D Projects are furthermore “Observable” (expected to create a New Relevant Product Market)*

In comparison to case group 3, the analysis of effects, stemming from pre-innovation product markets, is no longer a part of the anticompetitive assessment. The assessment of the effects, which do not hinge on pre-innovation product markets, should be carried out in analogy to case group 3. Hence, apart from merger specific efficiency gains (synergies, complementary assets, etc.) almost all effects indicate that a reduction of the number of competitors results in a reduction of aggregated R&D efforts and most likely in a delay of the introduction date of the innovation. The only general argument(s) in favor of less competition is the possibility that duplicative R&D efforts could be avoided and spillovers might get internalized. Apart from that, competition authorities have to assess whether one of the companies is way ahead of the other(s) in the innovation process and whether leapfrogging is expected to be possible, or not. Prominent merger cases which fall into this case group were, for instance, the mergers of Glaxo and Wellcome⁵⁸ or Ciba-Geigy and Sandoz^{59, 60}.

5. *The Merger affects Innovation Competition as well as Pre-Innovation Product Market Competition and R&D Projects are furthermore “Observable” (not expected to create a New Relevant Product Market)*

The assessment of mergers falling into case group 5 is very similar to those falling into case group 3. The main difference is that the “observed” R&D projects are expected to lead to product innovation which will be incremental in the sense that they do not constitute a new relevant product market.

In regard to the effects, stemming from a decrease in pre-innovation product market competition, the properties of case group 5 have the following effects for the competitive assessment (in comparison to case group 3):

- Due to the fact that this case group deals with incremental product innovations, the “pre-innovation market size and appropriability effect” might also have a positive impact on the innovation incentives, if the firms are unable to protect their innovations sufficiently by IPRs. However, since the industries in which R&D efforts are quite “observable” can mostly be characterized by a high relevance of IPRs, this positive impact is (as in case group 3 & 4) rather theoretical.

⁵⁸ See Glaxo plc, 119 F.T.C. 815 (1995).

⁵⁹ See Ciba-Geigy Ltd., 123 F.T.C. 842 (1997).

⁶⁰ See, also American Home Products Corp., 119 F.T.C. 217 (1995); Pfizer Inc. and Warner-Lambert Co., FTC Dkt. No. C-3957 (June 19, 2000); Baxter Int’l, Inc., 123 F.T.C. 904 (1997); The Upjohn, Co., 121 F.T.C. 44 (1996); Glaxo Wellcome plc, 131 F.T.C. 56 (2001).

- Apart from these changes, the assessment of effects stemming from pre-innovation product markets should be carried out in analogy to the corresponding assessment of case group 3.

In regard to the effects, which do not hinge on pre-innovation product markets, the properties of case group 5 have the following influence on the competitive assessment (in comparison to case group 3):

- The existence of a replacement effect is less likely to be a problem in this case group. Since the R&D programs aim at the development of products, which are expected to be offered on an existing relevant product market, they have to be considered as sufficiently substitutable. Hence, it is difficult to think of a replacement effect if the “new” and the “old” products are that interchangeable. Instead, these types of product innovations will rather lead to an increase in product variety. Nevertheless, an additional product entering an existing market will most likely result in an increase in competition on this market and thus to a decline of current profits. As a consequence, even though a real replacement is quite unlikely in this case group, there is still a risk that the target firm’s product innovation will never enter the market after the merger.
- Apart from these changes, the assessment of the effects, which do not hinge on pre-innovation product markets, should be carried out in analogy to the corresponding assessment of case group 3.

6. *The Merger affects only Innovation Competition and R&D Projects are furthermore “Observable” (not expected to create a New Relevant Product Market)*

In comparison to case group 5, the analysis of effects, stemming from pre-innovation product markets, is no longer a part of the anticompetitive assessment. The assessment of the effects, which do not hinge on pre-innovation product markets, should be carried out in analogy to case group 5.

Prominent merger cases which fall into this case group were, for instance, the merger of Hoechst and Marion Merrell Dow⁶¹ or the one between Astra and Zeneca.⁶²

⁶¹ See Hoechst AG, 120 F.T.C. 1010 (1995).

⁶² See Zeneca Group plc, 127 F.T.C. 874 (1999).

IV. Conclusion

This article identified and classified the most relevant effects, which determine the impact of innovation competition mergers on the incentives to invest in product innovation oriented R&D. In this connection we differentiated between merger cases in which the merger affects only the intensity of innovation competition, and those cases in which the merger has an impact on both innovation competition and pre-innovation product market competition. Besides this, the article furthermore identified the relevant determinants, which are decisive for how a certain effect acts on the incentives to innovate. However, since not every effect is always relevant and because of the fact that the determinants can also differ from case to case, the development of an assessment framework requires the classification and allocation of merger cases, which share the same properties, into case groups. As a result, each of these case groups encompasses those kinds of merger cases which require the assessment of similar effects and determinants. Hence, the review process varies from case group to case group, but remains consistent and uniform within each case group. Since such an approach allows combining the objective of a case-specific assessment with the requirement that this assessment is carried out in a consistent and transparent manner, it is in the spirit of a rule based competition policy.

As a consequence, this article contributes to the discussion about developing an assessment framework for analyzing the innovation effects of mergers. Thereby it was also shown that the interrelation between competition and the incentives to innovate is not always as unclear as it seems without making the differentiation between effects that hinge on pre-innovation product markets and those that do not. As a result, while the assessment of the effects of mergers on the firm's incentives to undertake product innovation oriented R&D can indeed be challenging in some case groups (in particular within case group 1), it turned out that the investigation is much less complex in others (in particular within case group 4).

However, it has to be recalled that this article focused exclusively on the incentives to invest in product innovation oriented R&D. Hence, it has to be acknowledged that the findings of this paper cannot be transferred to questions related to the effects of mergers on the incentives to invest in process innovations. This becomes particularly evident if one considers for the "Pre-Innovation Market Size and Appropriability Effect". Hereby it was shown that a merger can indeed result in decreased incentives to invest in product innovation oriented R&D, because the merger leads to a reallocation of the firm's R&D budget. This, however, implies that the incentives to undertake process innovations increase at the same time.

Besides this, a final assessment framework has to be supplemented by empirical studies in order to reveal the relevance and suitability of each of the theoretically developed assessment criteria.⁶³ Furthermore, even though this article focused exclusively on the assessment of the merged firm's incentives to innovate, the final assessment framework should not neglect to account for the benefits of "diversity" and "parallel research" for innovation. The consideration of incentive aspects alone will not be appropriate to capture innovation competition in its full extent.⁶⁴ Moreover, it also needs to be emphasized that the findings of this paper do not imply that mergers have per se an anticompetitive effect on innovation, once the assessment of the introduced effects leads to a negative outcome. There is still great potential for merger specific efficiencies. Such efficiencies can encompass *e.g.* synergies among the merging entities, economies of scale and scope in R&D, a reduction of duplicative R&D efforts or the bringing together of complementary assets. As a consequence, these positive efficiency gains have to be balanced against the negative effects that might be revealed by the prior analysis. Besides the necessity to balance the potentially negative innovation incentive effects of mergers against innovation related efficiencies gains, the assessment of innovation effects generally represents only one part of the overall competitive assessment of mergers. Even though this article also accounted for pre-innovation product markets, the analysis of static price and non-price effects was not part of the assessment. As a result, the competitive assessment of mergers is not completed until it is analyzed how a certain merger affects competition with respect to all competition parameters: static price and non-price competition as well as innovation competition.

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⁶³ See, *e.g.*, Kretschmer (2012).

⁶⁴ See Kern & Ackermann (2014).

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Essay III:

**Shedding Some Light on the Dark Matter of Competition:
Insights from the Strategic Management & Organizational Science Literature for
the Consideration of Diversity Aspects in Merger Review**

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Status:

Working Paper

MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.05-2014 (2014)

Eingereicht:

REVIEW OF LAW AND ECONOMICS
(abgelehnt und derzeit in Überarbeitung)

Vorgestellt auf:

AEDE 2013 (Spanish Association of Law and Economics), Granada

SHEDDING SOME LIGHT ON THE DARK MATTER OF COMPETITION: INSIGHTS FROM THE STRATEGIC MANAGEMENT & ORGANIZATIONAL SCIENCE LITERATURE FOR THE CONSIDERATION OF DIVERSITY ASPECTS IN MERGER REVIEW

Benjamin R. Kern, Malte Ackermann⁺*

ABSTRACT

A merger between two innovation competitors is often suspected to reduce the variety of heterogeneous entities which are currently undertaking R&D or which are well situated to undertake R&D in a certain field. The consequential reduction of “diversity” can be detrimental to innovation because it reduces the number of independent sources for possible future innovations and might furthermore lead to an alignment of formerly different R&D programs. However, if “diversity” indeed benefits innovative performance, even merged firms should have an incentive to maintain it in-house. Therefore, this article aims to bring to light whether firms can indeed be expected to create or maintain “diversity” post-merger. By focusing on the strategic management and organizational science literature we will demonstrate that the creation/maintenance of independent entities is indeed considered as an important determinant for the innovativeness and general performance of firms. Nevertheless, we will also show that this strategy has several grave implementation problems and might be hampered by certain trade-offs. As a consequence, competition authorities cannot presume that a reduced “inter-firm diversity” will get substituted by an increased “intra-firm diversity” without fail.

JEL: B52, K21, L4, M1, O31, O32

I. INTRODUCTION

The adequate consideration of innovation aspects in merger review was, and still is, one of the most controversially discussed issues among antitrust scholars.¹ A particularly critical aspect

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¹ See Richard J. Gilbert & Steven C. Sunshine, *Incorporating Dynamic Efficiency Concerns in Merger Analysis: The Use of Innovation Markets*, 63 ANTITRUST L.J. 569 (1995); Richard T. Rapp, *The Misapplication of the Innovation Market Approach to Merger Analysis*, 64 ANTITRUST L.J. 19 (1995); Robert J. Hoerner, *Innovation Markets: new Wine in old Bottles?*, 64 ANTITRUST L.J. 49 (1995); George A. Hay, *Innovations in Antitrust Enforcement*, 64 ANTITRUST L.J. 7 (1995); Howard M. Morse, *The Limits of*

of this discussion deals with the question whether a more or rather a less concentrated market structure (mostly narrowed to product market structure) is beneficial to innovation.² However, until to date, theoretical³ as well as empirical⁴ contributions delivered rather contradictory results in the sense that they support the proposition that highly competitive just as much as more concentrated markets can basically spur innovation. Hence, from this perspective, it is not clear whether a merger, which leads to a higher market concentration, is detrimental or maybe even beneficial to innovation.

However, while mainstream economics focused almost exclusively on the likely effects of a change of market structure on the firms' incentives to invest in R&D and their ability to innovate, a change of the market structure can also have an additional effect on innovation. This effect originates from the fact that a merger, which causes a reduction of the number of innovation competitors, can also harm innovation because it reduces the variety of heterogeneous entities which are currently undertaking R&D or which are well situated to undertake R&D in a certain field. This reduction can be detrimental to the overall innovativeness of an industry when we consider firms as being different with respect to their resources, their organizational structure, their business culture and the way how they do business.⁵ As soon as we allow for these differences, it is appropriate to regard each firm as an entity which has unique capabilities and individual beliefs about the most promising way to innovate. Since innovation is particularly subject to uncertainty, it is impossible to

Innovation Markets, 2 ANTITRUST & INTELL. PROP. (ABA SECTION OF ANTITRUST LAW NEWSL.) 22 (2001); Dennis W. Carlton & Robert H. Gertner, *Intellectual Property, Antitrust and Strategic Behavior*, in 3 INNOVATION POLICY AND THE ECONOMY 29 (Adam B. Jaffe et al. eds., MIT Press 2003); Robert W. Davis, *Innovation Markets and Merger Enforcement: Current Practice in Perspective*, 71 ANTITRUST L. J. 677 (2003); Michael Katz & Howard Shelanski, *Mergers and Innovation*, 74 ANTITRUST L. J. 1 (2007); Josef Drexl, *Anti-Competitive Stumbling Stones on the Way to a Cleaner World: Protecting Competition in Innovation without a Market*, 8 J. COMP. L. & ECON. 507 (2012).

² See Rapp, *supra* note 1, at 26 *et seq.*; Carlton & Gertner, *supra* note 1, at 39 *et seq.*; Davis, *supra* note 1, at 681 *et seq.*

³ See, e.g., Kenneth J. Arrow, *Economic Welfare and the Allocation of Resources to Invention*, in THE RATE AND DIRECTION OF ECONOMIC ACTIVITY 609 (Richard R. Nelson ed., Princeton University Press 1962); Glenn C. Loury, *Market Structure and Innovation*, 93 Q. J. ECON. 395 (1979); Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982); Jennifer F. Reinganum, *The timing of innovation: Research, development, and diffusion*, in 1 HANDBOOK OF INDUSTRIAL ORGANIZATION 849 (Richard Schmalensee & Robert Willig eds., Elsevier 1989); FREDERIC M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE, at 513-660 (Houghton-Mifflin, 3rd edn. 1990); Jan Boone, *Competitive Pressure: The Effects on Investments in Product and Process Innovation*, 31 RAND J. ECON. 549 (2000); Jan Boone, *Intensity of Competition and the Incentive to Innovate*, 19 INT. J. IND. ORGAN. 705 (2001); Philippe Aghion et al., *Competition and Innovation: An Inverted-U Relationship*, 120 Q. J. ECON. 701 (2005).

⁴ For an excellent overview see Richard J. Gilbert, *Looking for Mr. Schumpeter: Where Are We in the Competition-Innovation Debate?*, in 6 INNOVATION POLICY AND THE ECONOMY 159, at 187-204 (Adam B. Jaffe et al. eds., MIT Press 2006).

⁵ See Wolfgang Kerber, *Competition, Innovation and Maintaining Diversity Through Competition Law*, in ECONOMIC APPROACHES TO COMPETITION LAW: FOUNDATIONS AND LIMITATIONS 173 (Josef Drexl et al. eds., Edward Elgar 2010). See also Gilbert, *supra* note 4, at 185-186.

determine how a certain innovation has to be achieved or which R&D project will be most successful. As a consequence, for the overall innovativeness of an industry, or respectively a certain field of research, it is also beneficial that a variety of independent firms undertake R&D due to their subjective resources and expectations. Hence, in contrast to the considerations about the firms' incentives and abilities to innovate, this dimension of competition highlights the role of "diversity" for innovation and supports the idea that this characteristic of competition might also be worth protecting.

It is remarkable that these considerations also played a role in a considerable number of challenges to mergers and acquisitions, investigated by the Federal Trade Commission (FTC) and the Department of Justice (DoJ).⁶ In particular, the dissenting statements of Commissioner Mozelle W. Thompson and Commissioner Pamela J. Harbour in connection with the FTC's decision to close the Genzyme/Novazyme case indicate that this dimension of competition was, and still is, considered as an important but also highly disputed aspect in the review of mergers.⁷ However, in contrast to its relevance in applied merger review, this property of competition is much less recognized in the respective antitrust literature. One explanation for this phenomenon might be the fact that mainstream economics and especially the modern industrial organization literature have fundamental difficulties to capture this dimension of competition, which Joseph Farrell therefore called vividly "the dark matter of competition".^{8,9} Apart from that it is also argued that, if "diversity" indeed has a noticeable effect on innovation, a merged entity should have an incentive to preserve such a fruitful environment in-house.¹⁰ Hence, a reduction of "diversity" among different firms ("inter-firm diversity") might get balanced by an increase in the diversity within a certain firm ("intra-firm diversity") by itself. As a consequence, if one had to expect such an effect, antitrust authorities would have no reason to further consider this issue.

⁶ See, e.g., *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998); *Glaxo plc*, 119 F.T.C. 815 (1995); *The Upjohn, Co.*, 121 F.T.C. 44 (1996); *Ciba-Geigy Ltd.*, 123 F.T.C. 842 (1997); *Pfizer Inc. and Warner-Lambert Co.*, FTC Dkt. No. C-3957 (June 19, 2000).

⁷ Mozelle W. Thompson, *Dissenting Statement of Commissioner Mozelle W. Thompson Genzyme Corporation's Acquisition of Novazyme Pharmaceuticals Inc.*, File No. 021-0026 (Jan 13, 2004), available at <http://www.ftc.gov/os/2004/01/thompsongenzymestmt.pdf> (Aug. 20, 2013); Pamela J. Harbour, *Dissenting Statement of Pamela J. Harbour Genzyme Corporation's Acquisition of Novazyme Pharmaceuticals Inc.*, File No. 021-0026 (Jan 13, 2004), available at <http://www.ftc.gov/os/2004/01/harbourgenzymestmt.pdf> (Aug. 20, 2013).

⁸ See Joseph Farrell, *Complexity, diversity, and antitrust*, 51 ANTITRUST BULL. 165 (2006).

⁹ See, e.g., Stanley J. Metcalfe, *Evolution and Economic Change*, in *TECHNOLOGY AND ECONOMIC PROGRESS* 54 (Aubrey Silbertson ed., Macmillan 1989); Richard R. Nelson, *Recent Evolutionary Theorizing about Economic Change*, 33 J. ECON. LIT. 48 (1995); Kerber, *supra* note 5.

¹⁰ See Raaj K. Sah & Joseph E. Stiglitz, *The Invariance of Market Innovation to the Number of Firms*, 18 RAND J. ECON. 98, at 106 (1987).

Therefore, by assessing the management and organizational science literature, this article aims to bring to light whether and how firms consider the preservation of “diversity”, (1) either as a consequence of a newly created “intra-firm diversity”, or (2) because of a direct maintenance of an acquired firm’s autonomy, after a merger. For this purpose we firstly investigate the “Corporate Entrepreneurship” (CE) literature which highlights the creation of independent subunits and spinoffs within a corporation. We will thereby demonstrate that the idea of a creation of independent entities in-house is indeed considered as an important determinant for the innovativeness and general performance of firms. However, we will also show that firms, pursuing a CE strategy, will most likely face several grave implementation problems and trade-offs. The same holds true for a direct maintenance of “diversity” after a merger. Although the examined literature on post-merger integration presents strong arguments in favor of securing an acquired firm’s independence and autonomy in order to keep its innovation capacity, it also indicates that there will emerge a trade-off between this objective and the realization of efficiency gains through integration.

Hence, on the one hand, the extensive management and organizational science literature suggests that considerations about the preservation of “diversity” in merger review might be exaggerated because firms should indeed have a strong incentive to preserve “diversity” in-house. On the other hand, however, our analysis also shows that antitrust authorities cannot trust in the creation/maintenance of such an “intra-firm diversity” after a merger, since the merged entity will most likely face grave implementation problems and trade-offs.

This article is structured as follows. In Part II we will provide a review of the neoclassical economics and evolutionary economics literature and highlight the differences between the considerations about the incentives and abilities to innovate on the one hand and the benefits of “diversity” for innovation on the other. Thereby we will also provide some exemplary merger cases in order to illustrate how the idea of a preservation of an “inter-firm diversity” was considered in the applied U.S. merger review during the last two decades. Subsequently, in Part III we will analyze to what extent considerations about the creation/maintenance of independent entities within firms can be found in the management and organizational science literature and whether we find evidence that this strategy is indeed regarded as a promising approach. Thereby we want to answer the question whether antitrust authorities can expect a preservation of “diversity”, either as a consequence of a newly created “intra-firm diversity”, or because of a direct maintenance of an acquired firm’s autonomy, after a merger. Part IV then concludes by drawing implications for the consideration of “diversity” aspects in merger review.

II. COMPETITION AND INNOVATION

A. The incentives and abilities to innovate

A broad range of literature is dealing with the interdependencies between competition and the firms' incentives and abilities to innovate. The controversy in the academic debate started with Joseph Schumpeter who was particularly interested in the effects of competition on innovation.¹¹ In his early work he assumed that competition fosters innovation in the sense that predominantly creative "entrepreneurs" are the main driver for innovation.¹² In his view competition has to be seen as a process in which mainly small, innovative start-up firms come up with new ideas which then become manifest in new products and production processes.¹³ In his later works, however, Schumpeter conversely argued that mainly big firms in highly concentrated markets are the key to technological progress.¹⁴ Thereby he assumed that only these firms have the necessary ability to finance R&D projects, diversify the risks of innovative activities and appropriate its gains in a sufficient scale.

Apart from Schumpeter, a rich literature dealing with the effects of competition and concentration on innovation exists. Arrow demonstrated for example that the fruits of an innovation might (at least to some extent) solely replace previous profits (replacement-effect) if the innovator already has some market power on the respective pre-innovation market.¹⁵ Hence, in the extreme case of a firm holding a monopoly position, the firm must fear that it will solely cannibalize its current profits by introducing an innovation to the market. As a result, a firm which possesses market power on a pre-innovation market would have fewer incentives to invest in R&D than a firm which faces fierce competition and which therefore generates merely little or even no pre-innovation profits.

Another very popular and likewise important argument why a rather less concentrated market structure drives innovation is the assumption that a firm, which does not fear rivalry from other competitors, would have no incentives at all to develop new products or production processes, because there is no need to improve or defend its market position¹⁶ Yet another aspect why more competition might be the beneficial environment for innovation is based on the idea of patent races.¹⁷ An important characteristic of these models is the

¹¹ See JOSEPH A. SCHUMPETER, *THE THEORY OF ECONOMIC DEVELOPMENT. AN INQUIRY INTO PROFITS, CAPITAL, CREDIT, INTEREST, AND THE BUSINESS CYCLE* (Cambridge/Mass, Harvard University Press 1934).

¹² *Id.* at 74 *et seq.*

¹³ *Id.*

¹⁴ See JOSEPH A. SCHUMPETER, *CAPITALISM, SOCIALISM AND DEMOCRACY*, at 131-134 (Harper 1942).

¹⁵ See Arrow, *supra* note 3.

¹⁶ See John R. Hicks, *Annual Survey of Economic Theory: The Theory of Monopoly*, 3 *ECONOMETRICA* 1 (1935). See also Katz & Shelanski, *supra* note 1, at 9.

¹⁷ See Loury, *supra* note 3; Reinganum, *supra* note 3.

assumption that perfect patent protection exists. Under such a setting, the innovator gains an exclusive right to market the invention. Thus, every firm taking part in this race has a strong incentive to be the first to invent. As a consequence, consumers may benefit from such an environment in the sense that new products or technologies are discovered earlier as compared to a situation in which there is solely little or no competition.

However, like in the later work of Schumpeter, other scholars also argued that concentrated markets can equally foster innovation. By assuming product innovations and imperfect patent protection, Frederic Scherer and David Ross showed that increased competition can indeed foster innovation (stimulus factor) - but solely until a certain limit.¹⁸ Too much competition might also hinder innovation in the sense that under very intense competition it is no longer possible to undertake profitable R&D projects because the innovation costs can no longer be recouped (market room factor). The authors therefore described the interrelation between competition and innovation in the pattern of an inverted-U. This finding was confirmed in a recent article of Aghion et al.¹⁹ By differentiating between sectors with “neck-and-neck competitors” and those with “leading-” and “laggard competitors”, they showed that strong competition as well as market power can foster innovation, depending on whether the incentives to strive for “Schumpeterian rents” or the incentives to realize a so-called “escape-competition effect” outweighs the other. Other authors even demonstrated that also a monopoly might have strong incentives to innovate in order to defend its current monopoly position by patenting new technologies before potential competitors.²⁰ As a result, to date, no general causal interrelationship between market structure and the incentives and abilities to innovate has been found. However, this finding should be interpreted with caution. The majority of the contributions presented above investigated the interrelation between product market structure and innovation instead of competition in innovation and innovation (or the structure of an ‘Innovation Market’²¹ and innovation). Since the competitors with respect to innovation do not necessarily compete with one another on actual product markets, a merger which affects innovation competition does not inevitably affect product market concentration.²² If, however, a merger does not change product market structure, many arguments about the firms’ incentives and abilities to innovate, stemming from considerations about pre-innovation profits and the appropriability

¹⁸ See Scherer & Ross, *supra* note 3, at 630-644.

¹⁹ See Philippe Aghion et al., *Competition and Innovation: An Inverted-U Relationship*, 120 Q. J. ECON. 701 (2005).

²⁰ See Richard J. Gilbert & David M.G. Newbery, *Preemptive Patenting and the Persistence of Monopoly*, 72 AM. ECON. REV. 514 (1982).

²¹ See Gilbert & Sunshine, *supra* note 1.

²² See Gilbert & Sunshine, *supra* note 1; Drexler, *supra* note 1.

of innovation gains, do no longer play a role in such an environment. As a consequence, many findings of the literature cited above cannot be transferred one-to-one to the interrelation between innovation competition and innovation.

B. Competition, Diversity, Parallel Research and Innovation from an Evolutionary Economics Perspective

While the discussion introduced in the last chapter mainly dealt with the question how competition influences the firms' incentives and abilities to innovate, we will now focus on the role of "diversity" for innovation. It is remarkable that, in comparison to the questions related to a firm's incentives and abilities to innovate, much less research has been carried out with respect to this dimension of competition for innovation. However, in 2006 Joseph Farrell introduced a paper which demonstrates the relevance of "diversity" from a competition policy perspective in a very vivid way.²³ In his article about "Complexity, diversity, and antitrust" he described his situation as a person who has got a peanut allergy in the context of the research efforts of the big pharmaceutical firms for a proper treatment for this allergy. The story was told as follows: A small biotech company called Tanox pursued a promising peanut allergy treatment called TNX-901. But, in 2003, Tanox's corporation partners (Novartis and Genentech) insisted on the withdrawal of this research trial because, as they argued, the most promising drug was already found. However this promising treatment - Xolair - was already in the market for different indications. Whereon Farrell wondered:

"[...] why not pursue both potentially life-saving treatments? Apparently Tanox thought it worth pursuing TNX-901 given the status of Xolair, which would be the normal market test if no 'contract got in the way' [...]." ²⁴

So he asked himself: "Isn't diversity of approach one of the benefits of competition?"²⁵ And: "How, if at all, should antitrust seek to protect such diversity against (let's assume) technical experts' best judgements about 'the most promising project'?"²⁶

Even though very anecdotal, Farrell's considerations out of a private demand lead our attention to the question about the role of "diversity" for innovation and consumer welfare. Compared to the debate related to the firms' incentives and abilities to innovate, which is dominated by the industrial organization literature, the considerations about the important role of "diversity" are mainly rooted in evolutionary economics. The theoretical basis for

²³ See Farrell, *supra* note 8.

²⁴ Farrell, *supra* note 8 at 166.

²⁵ *Id.* at 166.

²⁶ *Id.* at 166.

considerations about these aspects can be seen in the Hayekian concept of “competition as a discovery procedure”.²⁷ Therein Hayek assumed that knowledge is always tacit, fragmental and dispersed.²⁸ Beside the storable, scientific knowledge, he emphasized the meaning of knowledge as a “particular circumstance[s] of time and place” which “never exists in concentrated or integrated form but solely as the dispersed bits of incomplete and frequently contradictory knowledge which all the separate individuals possess”.²⁹ Thus, for Hayek, knowledge has an inevitably subjective character. This holds especially true for individual expectations, abilities, routines or a firm’s business culture which is very important for day-to-day business, but hard to teach and learn. As a consequence, all individuals and all firms have a different knowledge base and should therefore be regarded as heterogeneous entities. Besides that, the idea of subjective knowledge in combination with (true) uncertainty³⁰ also implies that the firms do not perfectly know *ex ante* which product is suited best to fulfil consumers’ needs, match with their preferences or how a certain innovation should be achieved best. Instead, each firm necessarily has to form its own expectations. This implies, especially in regard to innovation, that actions with respect to the future always rely on assumptions and expectations which can be either right or wrong.

This point of view is again in line with Farrell who wondered whether one important characteristic of competition might already be the persistence with approaches that other market participants think unpromising.³¹ Farrell suggested that otherwise, “[...] if alternative approaches were clearly smart, even a monopoly could profitably pursue [them]”.³² This dimension of competition, the benefits of having a variety of different entities in the competition process, is what Farrell called very pictorially “the dark matter of competition”.³³

The described knowledge problem is also a key component of evolutionary economics more generally.³⁴ In their seminal works, Richard R. Nelson and Sidney G Winter, for example, consider firms as diverse sets of “routines”.³⁵ In this connection, competition is considered as a process of variation and selection in which heterogeneous firms continuously offer solutions, in the form of new or at least modified products, for the problems and needs

²⁷ See Friedrich A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519 (1945); Friedrich A. Hayek, *Competition as a Discovery Procedure*, in NEW STUDIES IN PHILOSOPHY, POLITICS, ECONOMICS AND THE HISTORY OF IDEAS 179 (Friedrich A. Hayek ed., University of Chicago Press 1978).

²⁸ See Friedrich A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519, at 519 (1945).

²⁹ Hayek, *supra* note 28 at 519.

³⁰ See FRANK H. KNIGHT, RISK, UNCERTAINTY, AND PROFIT, (Houghton Mifflin 1921).

³¹ See Farrell, *supra* note 8, at 168.

³² Farrell, *supra* note 8, at 168.

³³ *Id.* at 168.

³⁴ See Nelson *supra* note 9, Metcalfe *supra* note 9, Kerber *supra* note 5.

³⁵ See RICHARD R. NELSON & SIDNEY G. WINTER, AN EVOLUTIONARY THEORY OF ECONOMIC CHANGE, at 96 *et seq.* (Harvard University Press 1982).

of consumers.³⁶ Thus, competition has an inherent experimental character of trial and error in which only the firms which have the right beliefs and expectations will prevail, while the others will disappear.³⁷ As a result, a reduction in the number of competitors is understood as a natural phenomenon in the competition process.

In contrast to the original idea of Nelson and Winter, a further reduction in the number of independent competitors by mergers and acquisitions can nevertheless be detrimental for innovation. This applies if an already small number of innovation competitors coincide with the existence of remarkable entry barriers for the participation in a certain process of innovation competition.³⁸ In this case, the induced reduction of “diversity” cannot get balanced by new firms which could otherwise enter the process of innovation competition. However, this does not imply that the preservation of “diversity” should be put above everything else. It is undisputed that a trade-off between the benefits of having several independent firms undertaking R&D on the one hand and the advantages of integrating these efforts into a stronger and more efficient entity on the other can emerge.³⁹ Hence, in analogy to Oliver Williamson’s idea of an “efficiency defence”⁴⁰, such considerations about possible innovation related efficiency gains should likewise be an integral part within the assessment of innovation effects of mergers.

Beside Hayek and the evolutionary economics literature, the view of heterogeneity between market participants is also shared in the management literature, particularly in the “resource-based view of the firm”.⁴¹ This field of literature highlights the importance of a firm’s particular resources like especially trained staff, experience, patents or a firm’s business culture.⁴² Thus, in contrast to mainstream economics, where firms differ almost exclusively by the nature of their cost functions, firms are considered as entities which differ also with respect to their particular capabilities – capabilities which cannot be acquired and adopted easily in an adequate period of time. In regard to innovation, this assumption implies

³⁶ *Id.*

³⁷ *Id.*

³⁸ The idea of entry barriers for the participation in the process of innovation competition is closely linked to the proposed assessment of specialized assets in the Innovation Market Analysis. See Richard J. Gilbert & Steven C. Sunshine, *supra* note 1, at 588 *et seq.*

³⁹ See, e.g., Wesley M. Cohen & Steven Klepper, *The Tradeoff Between Firm Size and Diversity in the Pursuit of Technological Progress*, 4 SMALL BUS. ECON. 1 (1992).

⁴⁰ See Oliver E. Williamson, *Economics as an Anti-Trust Defense: The Welfare Trade-Offs*, 58 AM. ECON. REV. 18 (1968).

⁴¹ See EDITH PENROSE, *THE THEORY OF THE GROWTH OF THE FIRM* (John Wiley and Sons 1959); Jay B. Barney, *Firm Resources and Sustained Competitive Advantage*, 17 J. MANAGE. 99 (1991); CYNTHIA A. MONTGOMERY, *RESOURCE-BASED AND EVOLUTIONARY THEORIES OF THE FIRM: TOWARDS A SYNTHESIS* (Kluwer Academic Publishers 1995).

⁴² See, e.g., Scott L. Newbert, *Empirical Research on the Resource-Based View of the Firm: An Assessment and Suggestions for Future Research*, 28 STRATEG. MANAGE. J. 121 (2007).

that not only the incentives and the abilities to innovate matter, but also the variety of heterogeneous firms of which each might carry unique capabilities and ideas.

Apart from the insights provided by economists and scholars working in the field of strategic management, it is also important to refer to the biodiversity literature where researchers analyze for instance the consequences of a decrease in the richness of species as a result of monoculture or dying breeds.⁴³ In this respect it is argued that “diversity” matters in order to preserve nature’s capability to adapt to new conditions of a changing environment. This proposition is based on research findings which demonstrated that biodiversity indeed increases the probability that some species will adapt to an exogenous shock and therefore allow for a faster adjustment of the ecosystem to environmental changes.⁴⁴ Furthermore, Tilman et al. have shown that, due to a so-called “probability effect”, the productivity of plants is positively correlated with the degree of biodiversity.⁴⁵ These characteristics of biodiversity can also be understood as an “option-“ or “insurance value” which implies that “diversity” might play an essential role, even though the benefits are not obvious to us at the moment.⁴⁶

It is interesting that some of the particular arguments put forward in the biodiversity literature can be applied again to the economic context. The idea of an “option value”, for instance, is also well known to economists.⁴⁷ In the competition context this value is created due to the fact that, under uncertainty, it is a priori unknown which firm or technology is suited best to solve a certain problem in the future or how a certain technology can be achieved.⁴⁸ From this point of view, it can be of relevance that a variety of independent firms exists. In analogy to the biodiversity literature, “diversity” should, on the one hand, augment the likelihood that there is at least one firm which has the necessary capabilities to adapt to a

⁴³ See GISELA LINGE, COMPETITION POLICY, INNOVATION, AND DIVERSITY, at 122 *et seq.* (Tectum Verlag 2008); For a rich overview on the relevance of biodiversity see e.g. Nina-Marie E. Lister, *A systems approach to biodiversity conservation planning*, 49 ENVIRONMENTAL MENTORING AND ASSESSMENT 123 (1998).

⁴⁴ See, e.g., Randall Hughes & John J. Stachowicz, *Genetic diversity enhances the resistance of a seagrass ecosystem to disturbance*, 101 P. NATL. ACAD. SCI. USA. 8998 (2004); Boris Worm & J. E. Duffy, *Biodiversity, productivity and stability in real food webs*, 18 TRENDS ECOL. EVOL. 162 (2003); David Tilman & J. A. Downing, *Biodiversity and stability in grasslands*, 367 NATURE 363 (1994).

⁴⁵ See, David Tilman et al., *Diversity, productivity and temporal stability in the economics of humans and nature*, 49 J. ENVIRON. ECON. MANAG. 405, at 412 *et seq.* (2005).

⁴⁶ It is remarkable that also the United Nations declared the year 2010 to be the international year of biodiversity. See Julia Marton-Lefèvre, *Biodiversity Is Our Life*, 327 SCIENCE 1179, available at <http://www.sciencemag.org/content/327/5970/1179.full.pdf> (Feb. 5, 2013).

⁴⁷ See, e.g., Richard L. Schmalensee, *Option demand and consumer’s surplus: Valuing price changes under uncertainty*, 62 AM. ECON. REV. 813 (1972); Kenneth J. Arrow & Anthony C. Fisher, *Environmental Preservation, Uncertainty, and Irreversibility*, 88 Q. J. ECON. 312 (1974); David M. Kreps, *A representative theorem for ‘preferences for flexibility’*, 47 ECONOMETRICA 565 (1979).

⁴⁸ See, Stefan H. Thomke, EXPERIMENTATION MATTERS: UNLOCKING THE POTENTIAL OF NEW TECHNOLOGIES FOR INNOVATION, at 25 *et seq.* (Harvard Business School Press 2003).

possible “environmental change” and thereby solve a particular problem in the future. On the other hand, the “diversity” of approaches, in the sense of different currently employed R&D programs, can also lead to an increased probability that at least one of these current programs will be successful.

In summary, there are actually two different reasons why “diversity” can be beneficial for innovation. First, “diversity” can be of value in the sense that a variety of heterogeneous and independent sources for future innovation exists. As a consequence, consumers would benefit from this variety in the sense that there is not just one but a couple of firms which have the capability to produce future innovations in a certain field of research. This should, in analogy to the biodiversity literature, augment the probability that there is at least one firm that offers an adequate solution for a certain problem in the future. It is remarkable that especially the U.S. antitrust agencies have put forward this line of argumentation in several challenges to mergers and acquisitions.⁴⁹ In its complaint concerning the proposed acquisition of Northrop Grumman by Lockheed Martin in 1998 the DoJ argued for instance that:

“[...] Northrop, Lockheed, and Boeing do all pursue new ideas and designs for future high performance fixed-wing military aircraft to meet specific combat needs, and these firms are the only companies that have the capabilities to compete for combined electronics system integration and military airframe upgrades. The loss of Northrop as an independent entity will reduce the number of companies to which the Department of Defence can turn to design, develop, and produce high performance fixed-wing military aircraft from three to two.”⁵⁰

Hence, the DoJ obviously highlighted the relevance of the preservation of at least three independent entities as potential innovators and thereby aimed to protect “diversity” as an important feature of competition for innovation in order to meet future combat needs.⁵¹

In addition to the relevance of “diversity” as a source for future innovations in a particular field of research, the second reason why “diversity” might play a crucial role for innovation is linked to research and development efforts which are already underway. In this respect “diversity” refers to research tracks which are carried out in parallel by distinct and independent entities, entities which have different beliefs and expectations about the most promising way to achieve a certain innovation. This idea of “parallel experimentation” or

⁴⁹ See *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998); *United States v. General Dynamics Corp.*, Civ. No. 1:01CV02200 (D.D.C. complaint filed Oct. 23, 2001).

⁵⁰ See *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998), at 27.

⁵¹ See Daniel L. Rubinfeld & John Hoven, *Innovation and Antitrust Enforcement*, in *DYNAMIC COMPETITION AND PUBLIC POLICY: TECHNOLOGY, INNOVATION, AND ANTITRUST ISSUES* 65 (Jerry Ellig ed., Cambridge University Press 2001).

“parallel research” corresponds pretty much to Joseph Farrell’s Tanox-story in which he also questioned whether the abortion of the Xolair program might have been a bad decision from a consumers’ point of view. Like in the case in which “diversity” is understood as a source for future innovations, the U.S. antitrust agencies also challenged a remarkable number of mergers and acquisitions in which considerations about the preservation of existing parallel research paths played an important role.⁵² Thereby, the agencies argued in the majority of these merger cases that the transaction could lead to a “reduction or redirection” of research and development tracks. Hence, both the fear of a reduction as well as the suspected alignment of formerly independent research tracks can be associated with the protection of a “diversity” of research paths. Thus, in contrast to many industrial organization models in which “parallel research” is often seen as a wasteful duplication of R&D expenditures⁵³, “parallel research”, carried out by independent entities, has to be seen more positively from this perspective. However, in the mainstream economics literature, the relationship between competition and the number of independent firms which are simultaneously undertaking R&D on the one hand and the consequential benefits for innovation on the other, plays only a minor role.

A good example which illustrates how heterogeneity and “parallel research” is considered in mainstream economics is provided by the seminal article of Raaj K. Sah and Joseph E. Stiglitz.⁵⁴ Therein the authors demonstrated that, independently of the number of firms, there will always be an efficient market equilibrium (even though smaller than the socially optimal level) of research projects from an economy-wide perspective.⁵⁵ Given a certain value of an innovation, each firm will pursue a certain number of R&D projects to optimize its probability of success in dependence of its research costs. If the number of firms decreases, the number of research projects of the remaining firms’ increases and the total number of R&D projects in the market will still maximize the economy-wide probability for success. As a consequence, the number of firms pursuing research projects in parallel has no impact on the innovative performance of an industry. However, this result only holds under the strong assumptions that the firms are homogeneous (have the same capabilities to undertake R&D). The authors acknowledged that:

⁵² See, e.g., American Home Products Corp., 119 F.T.C. 217 (1995); Pfizer Inc. and Warner-Lambert Co., FTC Dkt. No. C-3957 (June 19, 2000); Baxter Int’l, Inc., 123 F.T.C. 904 (1997); Ciba-Geigy Ltd., 123 F.T.C. 842 (1997); The Upjohn, Co., 121 F.T.C. 44 (1996); Glaxo plc, 119 F.T.C. 815 (1995); Glaxo Wellcome plc, 131 F.T.C. 56 (2001).

⁵³ See, e.g., Loury, *supra* note 3; Reinganum, *supra* note 3.

⁵⁴ See Sah & Stiglitz, *supra* note 10, at 98 *et seq.*

⁵⁵ *Id.*

”[...] the probability of success of a particular project (conditional, say, on the failure of all other projects) is a function of the expenditure on that project and the expenditures on other projects, but not a function of the firms in which those other projects are undertaken.”⁵⁶

Thus, only if the firms are considered as not being different with respect to how they do business, it is irrelevant (the probability of a success innovation is unaffected) if for example two R&D projects are undertaken by two distinct firms or simply by one big firm. This, however, is an assumption which one has to doubt against an evolutionary economics background.

Hence, what is important for understanding the benefits of “diversity” is not only the consideration for uncertainty about how a certain innovation can be achieved best, but also the heterogeneity of the firms’ resources and capabilities for innovation as well as their subjective opinions about the most promising way to achieve them. Thus, our notion of “diversity” corresponds very well to what Constance K. Robinson, the former director of operations and merger enforcement of the DoJ, had in mind when she stated: “Even if two firms are attempting to achieve the same goal, they will approach this effort in different ways, making different choices along the way.”⁵⁷ And, most importantly: “It is a matter of judgment as to the extent that one R&D effort duplicates another, and even small differences can make one attempt successful and another a failure.”⁵⁸ Hence, from this perspective, it is not sufficient that firms merely undertake multiple R&D programs in parallel because they do not know which program is suited best in order to achieve a certain innovation.⁵⁹ Instead, it is also important that these programs are carried out by different entities with different resource bases, cultures and different executives who decide about what is promising and what is not.

Nevertheless, there still remains a fundamental question. If the probability of a successful innovation also hinges on the variety of different, independent entities with unique capabilities, ideas, visions and business cultures - why should the merged entity abandon this variety? Would the merged firm not have an incentive to maintain this “diversity” in-house in

⁵⁶ *Id.*, at 106.

⁵⁷ Constance K. Robinson, *Leap-frog and Other Forms of Innovation: Protecting the Future for High-Tech and Emerging Industries Through Merger Enforcement*, Address before ABA, at 2 (June 10, 1999), available at <http://www.usdoj.gov/atr/public/speeches/2482.pdf> (Nov. 7, 2012).

⁵⁸ *Id.*

⁵⁹ See, e.g., Richard R. Nelson, *Uncertainty, Learning, and the Economics of Parallel R and D efforts*, 43 REV. ECON. STAT. 351 (1961); William J. Abernathy & Richard S. Rosenbloom, *Parallel Strategies in Development Projects*, 15 MANAGE. SCI. (10, Application Series) B486 (1969); Balaji S. Chakravarthy, *Adaption: A promising metaphor for strategic management*, 7 ACAD. MANAGE. REV. 35 (1982); Peter Moran & Sumantra Ghosal, *Markets, Firms, and the Process of Economic Development*, 24 ACAD. MANAGE. REV. 390 (1999); Thomke, *supra* note 48.

order to augment its probability of a successful innovation? Raaj K. Sah and Joseph E. Stiglitz already argued that:

“[...] if different projects within a firm are sufficiently isolated from one another (for instance, because of the need to monitor the performance of different groups of researchers), then the firm affiliation may be less relevant.”⁶⁰

The same question can be posed with respect to the first characteristic of “diversity”. If “diversity” indeed augments the probability that at least one firm has the capability to solve an unspecified problem in the future and will therefore successfully adapt to an environmental change, firms should again have an incentive to create/maintain such an environment in-house, in order to ensure their survival in the long-run.⁶¹

Hence, the crucial questions which have to be clarified in this respect are (1) whether firms do indeed consider the preservation of “diversity” in-house, either as a consequence of a newly created “intra-firm diversity”, or because of a direct maintenance of an acquired firm’s autonomy, after a merger. If our considerations about the benefits of “diversity” are correct, one would expect that we can also find respective evidence for this assumption in the more practitioner-oriented management and organizational science literature. However, in the event that we find evidence for the assumption that firms do indeed consider the creation/maintenance of “diversity”, it is still not guaranteed that they will really undertake such an attempt at the end of the day. Firms might face significant trade-offs, as well as problems in line with the creation/maintenance of “diversity” in-house. Hence, (2) we want to find out whether competition authorities can rely on an increase in the “intra-firm-diversity” which would compensate for a reduction of “inter-firm-diversity”, or whether they should rather expect a loss of “diversity” and some sort of alignment of formerly different approaches?

III. DIVERSITY FROM A MANAGEMENT AND ORGANIZATIONAL SCIENCE PERSPECTIVE

A. Corporate Entrepreneurship literature

The role of “diversity” for the innovativeness and general performance of firms is indeed not unknown in the field of strategic management. An important strand of literature which considers the idea of the introduced concept of “intra-firm diversity” is the Corporate

⁶⁰ Sah & Stiglitz, *supra* note 10, at 106.

⁶¹ See James G. March, *Exploration and Exploitation in Organizational Learning*, 2 ORGAN. SCI. 71 (1991); Daniel A. Levinthal & James G. March, *The Myopia of Learning*, 14 STRATEG. MANAGE. J. 95 (1993).

Entrepreneurship (CE) literature. Although scholars have not reached a real consensus on exactly labeling the concept⁶² (the terms vary from “intrapreneurship”⁶³, “internal corporate entrepreneurship”⁶⁴, “corporate venturing”⁶⁵, “new ventures”⁶⁶ and “entrepreneurial management”⁶⁷ to “strategic entrepreneurship”⁶⁸), the common idea behind these terms can generally be summed up under the before mentioned ideational umbrella: Corporate Entrepreneurship.⁶⁹ The same holds true with respect to the objective of what CE should actually achieve. The most prominent definitions range from diversification processes⁷⁰, the transformation of ideas into collective actions⁷¹, the encouragement for risk taking⁷², the venturing of new business units⁷³, strategic renewal⁷⁴, the creation of new products or technologies⁷⁵, to the development of new markets⁷⁶. However, the vast majority of the

⁶² See Lan Li et al., *An Empirical study of Corporate Entrepreneurship in Hospitality Companies*, 10 INT. J. HOSP. TOURISM ADM. 213 (2009); Karina S. Christensen, *A Classification of the Corporate Entrepreneurship Umbrella: Labels and Perspectives*, 1 I. J. MED. 301 (2004); Gregory G. Dess et al., *Emerging Issues in Corporate Entrepreneurship*, 29 J. MANAGE. 351 (2003).

⁶³ See, e.g., GIFFORD PINCHOT, *INTRAPRENEURING: WHY YOU DON'T HAVE TO LEAVE THE CORPORATION TO BECOME AN ENTREPRENEUR*, (Harper And Row, New York 1985); Camille Carrier, *Intrapreneurship in Large Firms and SMEs: A comparative Study*, 12 INT. SMALL BUS. J. 54 (1994); Camille Carrier, *Intrapreneurship in small Businesses: An exploratory Study*, 21 ENTREP. THEORY PRACT. 5 (1996); Bostjan Antoncic & Robert D. Hisrich, *Intrapreneurship: Construct Refinement and Cross-Cultural Validation*, 16 J. BUS. VENTURING 495 (2001); Lin Chinho et al., *Fuzzy Fitness model of Intrapreneurship activities or Taiwanese High-Tech Firms*, 1 I. J. MED. 45 (2003).

⁶⁴ See, e.g., Hans Schollhammer, *The Efficacy of Internal Corporate Entrepreneurship Strategies*, in FRONTIERS OF ENTREPRENEURSHIP RESEARCH (Karl H. Vesper eds., Wellesley/Mass, Babson College 1981); Gareth R. Jones & John E. Butler, *Managing internal Corporate Entrepreneurship: An agency theory Perspective*, 18 J. MANAGE. 733 (1992); G. T. Lumpkin & Gregory G. Dess, *Clarifying the entrepreneurial orientation construct and linking it to performance*, 21 ACAD. MANAGE. REV. 135 (1996).

⁶⁵ See R. J. Ellis & N. T. Taylor, *Specifying Entrepreneurship*, in FRONTIERS OF ENTREPRENEURSHIP RESEARCH 527 (N. C. Churchill et al. eds., Babson College, Wellesley/Mass 1987).

⁶⁶ See Edward B. Roberts, *New Ventures for Corporate Growth*, 58 HARVARD BUS. REV. 134 (1980).

⁶⁷ See Howard H. Stevenson & J. Carlos Jarillo, *A Paradigm of Entrepreneurship: Entrepreneurial Management*, 11 STRATEGIC MANAGE. J. 17 (1990).

⁶⁸ See, e.g., Michael A. Hitt et al., *Guest Editors' Introduction to the Special Issue Strategic Entrepreneurship: Entrepreneurial Strategies for Wealth Creation*, 22 STRATEGIC MANAGE. J. 479 (2001); R. Duane Ireland et al., *Integrating Entrepreneurship and strategic management: Actions to create firm wealth*, 15 ACAD. MANAGE. EXEC. 49 (2001).

⁶⁹ See Robert A. Burgelman, *Corporate Entrepreneurship and Strategic Management: Insights from a Process Study*, 29 MANAGE. SCI. 1349 (1983).

⁷⁰ *Id.*, at 1349.

⁷¹ Lai Hong Chung & Patrick T. Gibbons, *Corporate Entrepreneurship: The roles of Ideology and social Capital*, 22 GROUP ORGAN. MANAGE. 10, at 14 (1997).

⁷² Shaker A. Zahra, *Governance, Ownership, and Corporate Entrepreneurship: The moderating impact of industry technological opportunities*, 39 ACAD. MANAGE. J. 1713 (1996).

⁷³ M.S. Spann et al., *Entrepreneurship: Definitions, dimensions and dilemmas*, PROCEEDINGS OF THE US ASSOCIATION FOR SMALL BUSINESS AND ENTREPRENEURSHIP 147, at 149 (1988).

⁷⁴ William D. Guth & Ari Ginsberg, *Guest Editors' Introduction: Corporate Entrepreneurship*, 11 STRATEGIC MANAGE. J. 5, at 5 (1990).

⁷⁵ See Spann et al., *supra* note 73, at 149.

⁷⁶ See Daniel F. Jennings & James R. Lumpkin, *Functioning modeling Corporate Entrepreneurship: An empirical Integrative Analysis*, 15 J. MANAGE. 485, at 489 (1989).

definitions agree on the fact that CE aims, above all, at the enhancement of a firm's capability to generate innovations.⁷⁷ Or as Covin et al. have put it:

“[...] innovation, broadly defined, is the single common theme underlying all forms of corporate entrepreneurship.”⁷⁸

This stems from the fact that, from a management perspective, it is widely accepted that the generation of innovation in large firms requires numerous prerequisites such as adaptability, flexibility, corporate risk-taking behavior, speed or aggressiveness.⁷⁹ As a consequence, there are various reasons why firms engage in the processes associated with CE. When established companies seek new business opportunities, they have to overcome various internal boundaries such as administrative barriers, risk aversion or organizational slack. Moreover, organizations are facing increased demands on individual products, fast-changing markets and increasing information flows. This requires a well adapting, flexible or even an entrepreneurial company.

In order to overcome these problems and to generate an environment which fosters innovation, the Corporate Entrepreneurship literature often suggests the creation of independent units which have only limited structural linkages to the organization and which therefore possess a high degree of freedom of choice.⁸⁰ Such an approach ought to combine the entrepreneurial spirit of small, independent companies with the resources of large corporations.⁸¹ In particular, the establishment of these independent entities within a corporation is expected to be superior in the sense that it serves as a competitive advantage through the exploration of entrepreneurial opportunities and thus the generation of innovation.⁸²

⁷⁷ See Elspeth McFadzean et al., *Corporate Entrepreneurship and Innovation Part 1: The missing link*, 8 E. J. IM. 350 (2005).

⁷⁸ Jeffrey G. Covin & Morgan P. Miles, *Corporate Entrepreneurship and the Pursuit of Competitive Advantage*, 23 ENTREP. THEORY PRACT. 47 (1999).

⁷⁹ See Jennings & Lumpkin, *supra* note 76.

⁸⁰ See Eric von Hippel, *Successful and Failing Internal Corporate ventures: An Empirical Analysis*, 6 IND. MARKET. MANAG. 163 (1977); Morgan P. Miles & Jeffrey G. Covin, *Exploring the practice of corporate venturing: Some common forms and their organizational implications*, 26 ENTREP. THEORY PRACT. 21 (2002); Thomas Keil, *Building External Corporate Venturing Capability*, 41 J. MANAGE. STUD. 799 (2004).

⁸¹ See Edwin L. Hobson & Richard M. Morrison, *How Do Corporate Start-Up Ventures fare?*, in FRONTIERS OF ENTREPRENEURSHIP RESEARCH 390 (John A. Hornaday et al. eds., Babson Centre For Entrepreneurial Studies, Wellesley/Mass 1983).

⁸² See Jeffrey G. Covin & Morgan P. Miles, *Corporate Entrepreneurship and the Pursuit of Competitive Advantage*, 23 ENTREP. THEORY PRACT. 47 (1999); R. Duane Ireland et al., *Conceptualizing Corporate Entrepreneurship Strategy*, 33 ENTREP. THEORY PRACT. 19 (2009); James C. Hayton, *Strategic Human Capital Management In Smes: An empirical study of Entrepreneurial Performance*, 42 HUM. RESOURCE MANAGE. 375 (2003); Todd J. Hostager et al., *Seeing environmental Opportunities: Effects of Intrapreneurial Ability, Efficacy, Motivation and Desirability*, 11 J. ORGAN. CHANGE MANAGE. 11 (1998).

In practice, Corporate Entrepreneurship can have numerous manifestations such as subsidiaries, joint-ventures, strategic alliances, business units or most recently the open-innovation approaches.⁸³ Nevertheless, in the context of CE, all of these organization forms share the property that they aim to foster the innovativeness of corporations by also considering the benefits of decentralization and autonomy as an important factor in order to reinvigorate the entrepreneurial spirit, behavior and capabilities within established firms. Or as Srivastava and Agrawal have put it:

“[...] corporate entrepreneurship is basically an organisational mode, characterized by the factors of freedom and autonomy, allowing employees to innovate.”⁸⁴

Hence, the CE literature can mainly be linked to the question whether firms can be expected to (newly) create “diversity” in-house, irrespectively of their decision regarding the direct maintenance/abandonment of the firms’ autonomy in a particular merger.

It is remarkable that empirical research within the Corporate Entrepreneurship Literature has discovered that CE, if applied successfully, has indeed a significant impact on firm growth⁸⁵ and their financial performance⁸⁶. Hence, it is not surprising that many corporations engage in CE processes. Our literature review has brought to light several case studies on CE in corporations such as Philips⁸⁷, Intel and General Electric⁸⁸, FedEx⁸⁹, Sony⁹⁰, Google⁹¹, Accordia⁹², AT&T⁹³ or 3M⁹⁴ just to name a few. Apart from these particular company

⁸³ See Bing-Sheng Teng, *Corporate Entrepreneurship Activities through strategic alliances: A resource-based approach toward Competitive Advantage*, 44 J. MANAGE. STUD. 119 (2007); MICHAEL H. MORRIS ET AL., *CORPORATE ENTREPRENEURSHIP & INNOVATION* (2nd ed., South-Western/Mason 2008).

⁸⁴ Nidhi Srivastava & Anand Agrawal, *Factors supporting Corporate Entrepreneurship: An exploratory Study*, 14 J. BUS. PERSP. 163 at 165 *et seq.* (2010).

⁸⁵ See, e.g., Bostjan Antoncic & Robert D. Hisrich, *Intrepreneurship: Construct refinement and cross-cultural validation*, 16 J. BUS. VENTURING 495 (2001); Franz W. Kellermanns & Kimberly A. Eddleston, *Corporate Entrepreneurship in family firms: A family perspective*, 30 ENTREP. THEORY PRACT. 809 (2006).

⁸⁶ See, e.g., Shaker A. Zahra & Jeffrey G. Covin, *Contextual Influences on the Corporate Entrepreneurship performance relationship: A longitudinal analysis*, 10 J. BUS. VENTURING 43 (1995); Nihat Kaya, *The impact of human resource management: practices and Corporate Entrepreneurship on firm performance: Evidence from Turkish firms*, 17 INT. J. OF HUM. RESOUR. MAN. 2074 (2006).

⁸⁷ See Simon Ford et al., *Evolving Corporate Entrepreneurship strategy: Technology incubation at Philips*, 40 R&D MANAGE. 81 (2010).

⁸⁸ See John Zimmerman, *Corporate Entrepreneurship at GE and Intel*, 6 JBCS. 77 (2010).

⁸⁹ See Broto R. Bhardwaj & Kirankumar S. Momaya, *Role of Organizational flexibility for Corporate Entrepreneurship: Case study of Fedex Corporation*, 7 GLOB. J. FLEX. SYSTEMS MANAGE. 37 (2006).

⁹⁰ See Chung & Gibbons, *supra* note 71, at 12.

⁹¹ See Todd A. Finkle, *Corporate Entrepreneurship and innovation in silicon valley: The case of Google, Inc.*, 36 ENTREP. THEORY PRACT. 863 (2012).

⁹² See Donald F. Kuratko et al., *Improving Firm Performance Through Entrepreneurial Actions: Acordia's Corporate Entrepreneurship Strategy*, 15 ACAD. MANAGE. EXEC. 60 (2001).

⁹³ See Michael H. Morris & J. Don Trotter, *Institutionalizing Entrepreneurship in a large company: A Case Study at AT&T*, 19 IND. MANKET MANAG. 131 (1990).

⁹⁴ See Hostager et al., *supra* note 82, at 12 *et seq.*

examples, CE activity has also been reported for instance from Canadian⁹⁵, German⁹⁶, New Zealand⁹⁷ or Dutch corporations⁹⁸. It is not even bound to highly industrialized countries, since we found examples of CE activity in China⁹⁹, Turkey¹⁰⁰ or Argentina¹⁰¹.

However, our assessment of the Corporate Entrepreneurship literature also revealed two important limitations with respect to the implementation of CE. (1) Empirical studies showed, that the employment of CE is apparently underlying certain variations. In the 1960s and early 1970s, 25% of the Fortune 500 had a corporate venturing program. These were largely disbanded in the 1970s. By the early 1980s, the corporate venturing was put back on the spot of corporations. But again, these initiatives were discontinued after the market downturn in 1987. In the beginning of the 1990s the corporate venturing efforts were gaining momentum again and corporations have re-introduced CE activities.¹⁰² After the dot-com bubble burst, the initiatives were reconsidered and restructured again, since many firms were dissatisfied with the outcomes of the CE practices.¹⁰³ Hence, CE seems to depend upon some kind of zeitgeist. (2) Even though several studies reported that some firms were remarkably rewarded after successfully relying on a CE strategy, other empirical studies which focused on the overall success rate of applied CE programs delivered much less promising results. Strebel, for instance, discovered that the success rates of corporate reengineering in Fortune 1000 companies are solely between 20 and 50%¹⁰⁴ and comparable observations lead Morris et al. to make the following disillusioning statement:

“The disappointment [...] reflects the fact that many companies are not very good at corporate venturing, or creating new businesses within their existing business.”¹⁰⁵

⁹⁵ See Erik G. Rule & Donald W. Irwin, *Fostering Intrapreneurship: The new competitive edge*, 9 IJBS. 44 (1988).

⁹⁶ See Ralf Schmelter et al., *Boosting Corporate Entrepreneurship through HRM practices: Evidence from German SMEs*, 49 HUM. RESSOURCE MANAGE. 715 (2010).

⁹⁷ See Jarrod M. Haar & Brook J. White, *Corporate Entrepreneurship and information technology towards employee retention: A study of New Zealand firms*, 23 HUMAN RESOURCE MANAGEMENT JOURNAL 109 (2013).

⁹⁸ See Bruce H. Kemelgor, *A comparative analysis of Corporate Entrepreneurial orientation between selected firms in the Netherlands and the USA*, 14 ENTREP. REGION DEV. 67 (2002).

⁹⁹ See Zhe Zhang & Ming Jia, *Using social exchange theory to predict the effects of High-Performance Human Resource practices on Corporate Entrepreneurship: Evidence from China*, 49 HUM. RESOURCE MANAGE. 743 (2010).

¹⁰⁰ See Kaya, *supra* note 86, at 2074 *et seq.*

¹⁰¹ See SERGIO POSTIGO, *CORPORATE ENTREPRENEURSHIP: AN EXPLORATORY RESEARCH IN ARGENTINA* (Universidad de San Andrés 2002).

¹⁰² See Henry Chesbrough, *Designing corporate ventures in the shadow of private venture capital*, 42/3 CALIF. MANAGE. REV. 31 (2000).

¹⁰³ See Morris et al., *supra* note 83, at 95.

¹⁰⁴ See Paul Strebel, *Why do Employees Resist Change?* 74 HARVARD BUS. REV. 86 (1996).

¹⁰⁵ See Morris et al., *supra* note 83, at 87.

This relatively poor performance might be caused by the fact that CE requires that it is embedded in the appropriate organizational environment. Such a CE-friendly environment can be characterized by the proper interplay of several factors which can be assigned to the following five main categories: organizational structure¹⁰⁶, corporate culture¹⁰⁷, human resource management¹⁰⁸, corporate strategy¹⁰⁹ and extern factors¹¹⁰ (based on Morris and

¹⁰⁶ See Srivastava & Agrawal, *supra* note 84, at 165 *et seq.*; GARETH R. JONES, ORGANIZATIONAL THEORY, DESIGN, AND CHANGE (5th ed. Prentice Hall 2006); Robert D. Russell & Craig J. Russel, *An examination of the effects of organizational norms, organizational structure and environmental uncertainty on entrepreneurial strategy*, 18 J. MANAGE. 639 (1992); Dennis H. Ferguson et al., *Intrapreneuring in hospitality organizations*, 6 INT. J. HOSP. MANAG. 23 (1987); Bhardwaj & Kirankumar et al., *supra* note 89, at 132 *et seq.*; Jeffrey S. Hornsby et al., *Middle managers' perception of the internal environment for Corporate Entrepreneurship: Assessing a measurement scale*, 17 J. BUS. VENTURING 253 (2002); Daniel F. Jennings & Samuel L. Seaman, *Aggressiveness of response to new business opportunities following deregulation: An empirical study of established financial firms*, 5 J. BUS. VENTURING 177 (1990); Allan Gibb, *Corporate restructuring and entrepreneurship: What can large organizations learn from Small?*, 1 IJEIMS. 19 (2000); James B. Quinn, *Managing innovation: Controlled chaos*, 63 HARVARD BUS. REV. 73 (1985); JOHN NAISBITT, GLOBAL PARADOX (Nicholas Brealey Publishing, London 1994).

¹⁰⁷ See JERALD GREENBERG & ROBERT A. BARON, BEHAVIOR IN ORGANIZATIONS (Prentice Hall 1997); Mark N. Clemente & David S. Greenspan, *Culture Clashes*, 16 EXECUTIVE EXCELLENCE 12 (1999); Golnaz Sadri & Brian Lees, *Developing corporate culture as a competitive advantage*, 20 J. MANAGE. DEV. 853 (2001); Chung & Gibbons, *supra* note 71, at 18 *et seq.*; Jeffrey G. Gown, *Entrepreneurial versus conservative firms: A comparison of Strategies and Performance*, 28 J. MANAGE. STUD. 439 (1991); Rosabeth M. Kanter, *When a thousand flowers bloom: Structural, social and collective conditions for innovation organizations*, in 10 RESEARCH IN ORGANIZATIONAL BEHAVIOR 169 (Barry M. Staw & Larry L. Cummings eds., Greenwich 1988); Michael H. Morris et al., *Individualism and the modern Corporation: Implications for Innovation and Entrepreneurship*, 19 J. MANAGE. 595 (1993); Morris & Trotter, *supra* note 93, at 133 *et seq.*; Bhardwai & Momaya, *supra* note 89, at 41 *et seq.*; Ferguson et al., *supra* note 106, at 27 *et seq.*

¹⁰⁸ See MARK A. HUSELID ET AL., THE WORKFORCE SCORECARD: MANAGING HUMAN CAPITAL TO EXECUTE STRATEGY (Boston/Mass, Harvard Business School Press 2005); Sully Taylor et al., *Guest Editors' Introduction: Introduction to HRM's role in sustainability: Systems, strategies, and practices*, 51 HUM. RESOURCE MANAGE. 789 (2012); Judith W. Tansky et al., *What's Next? Linking entrepreneurship and Human Resource Management in Globalization*, 49 HUM. RESOURCE MANAGE. 689 (2010); Schmelter et al., *supra* note 96, at 716 *et seq.*; Daniel T. Holt et al., *Corporate Entrepreneurship: An empirical look at individual characteristics, context, and process*, 13 J. LEADER ORGAN. STUD. 40, at 43 *et seq.* (2007); Hornsby et al., *supra* note 106, at 253 *et seq.*; Hostager et al., *supra* note 82, at 16 *et seq.*; Miri Lerner, *The Role of Compensation Methods in Corporate Entrepreneurship* 39 INT. STU. OF MANAGE. 53 (2009); Hayton., *supra* note 82, at 377 *et seq.*; Kaya, *supra* note 86, at 2078 *et seq.*; Melissa S. Cardon, *Is passion contagious? The transference of Entrepreneurial passion to employees*, 18 HUM. RESOUR. MANAGE. R. 77 (2008); Ferguson et al., *supra* note 106, at 29 *et seq.*, Morris & Trotter, *supra* note 93, at 136 *et seq.*; Gordon R. Foxall & Aron L. Minkes, *Beyond Marketing: The diffusion of entrepreneurship in the modern corporation*, 4 J. STRAT. MARKET 71 (1996); Terrence C. Sebor, et al., *Corporate entrepreneurship in the face of changing competition: A case analysis of six Thai manufacturing firms*, 23 J. ORGAN. CHANGE MANAGE. 453 (2010).

¹⁰⁹ See RICHARD P. RUMELT, STRATEGY, STRUCTURE, AND ECONOMIC PERFORMANCE (Cambridge/Mass, Harvard University Press 1974); Bruce R. Barringer & Allen C. Bluedorn, *The relationship between Corporate Entrepreneurship and Strategic Management*, 20 STRATEGIC MANAGE. J. 421 (1999); JEROEN DE JONG, INDIVIDUAL INNOVATION: THE CONNECTION BETWEEN LEADERSHIP AND EMPLOYEE'S INNOVATIVE WORK BEHAVIOUR (Zoetermeer, Scales Research Reports from EIM Business and Policy Research 2007); Srivastava & Agrawal., *supra* note 84 at 168 *et seq.*; RICHARD L. DAFT ET AL., ORGANIZATION THEORY AND PRACTICE (Cengage/Hampshire 2010); Jennings & Seaman, *supra* note 106; Shaker A. Zahra et al., *Entrepreneurship in medium-size companies: Exploring the effects of ownership and governance systems*, 26 J. MANAGE. 947 (2000); Hornsby et al., *supra* note 106, at 254 *et seq.*; Ferguson et al., *supra* note 106 at 26 *et seq.*; Zahra, *supra* note 72, at 1714 *et seq.*; Zahra & Govin., *supra* note 86 at 46 *et seq.*

¹¹⁰ See Argyro Nikiforou et al., *The impact of networks on corporate entrepreneurship: lost in the structural holes*, 31 FR. ENTREP. RESEARCH 15 (2011); Dirk Miller et al., *Strategic process and content as mediators between organizational context and structure*, 31 ACAD. MANAGE. J. 554 (1988); Ana M. Romero-Martinez

Trotter¹¹¹, Srivastava and Agrawal¹¹², and Ireland et al.¹¹³). Hence, besides the extremely unlikely case in which a firm possesses such a CE-friendly environment automatically, it has to change its organizational structure, corporate culture, human resource management and corporate strategy in order to ensure a successful implementation of CE. As a consequence, it can be concluded that the willingness and ability to successfully change these factors towards a CE-friendly environment will, at the end of the day, also determine whether the implementation of CE will be successful or not. However, apart from the fact that the modification of the external factors is outside the scope of the firm, the attempt of changing the remaining internal factors is an ambitious and very risky undertaking. Beside the worrisome findings of Sirkin et al., who discovered that two out of every three transformation programs fail¹¹⁴, it was furthermore observed that firms are generally very reluctant with respect to attempts on organizational change (even though these changes are expected to improve their performance).¹¹⁵ This phenomenon, often called “structural inertia”¹¹⁶, is remarkable at first sight. However, Massimo Colombo and Marco Delmastro provided a comprehensive overview on explanations why firms might avoid any attempt of organizational change.¹¹⁷ In the population ecology literature, for example, it is argued that stable organizations with standardized routines create an environment of reliability and accountability - two properties that can also constitute an advantage in the evolutionary process of variation and selection.¹¹⁸ If this is the case, it would imply that many firms which have remained in saturated industries most likely possess a stable organizational structure which is rather resistant to change. By assuming bounded rationality of economic agents and

et al, *Exploring corporate entrepreneurship in privatized firms*, 45 J. WORLD BUS. 2 (2010); Guth & Ginsberg, *supra* note 74, at 7 *et seq.*; Zahra & Govin, *supra* note 86, at 48 *et seq.*; E. RALPH BIGGADIKE, *CORPORATE DIVERSIFICATION: ENTRY, STRATEGY AND PERFORMANCE*. BOSTON: DIVISION OF RESEARCH, (Harvard University. 1976); P.P. McDougall & R.B. Robinson, *New venture performance: Patterns of strategic behavior in different industries*, in *FRONTIERS OF ENTREPRENEURSHIP RESEARCH* 447 (B. A. Kirchoff et al. Eds, Wellesley, MA: Babson College., 1988); W. R. Sandberg, & C. W., Hofer, *Improving new venture performance: The role of strategy, industry structure, and the entrepreneur*, 2 J. BUS. VENTURING 5 (1987); Ravi Kathuria & Joshi, P. Maheshkumar, *Environmental influences on corporate entrepreneurship: executive perspectives on the internet*, 3 INT. ENTREP. MANAG. J. 127 (2007); PETER KILBY, *ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT* (New York: The Free Press, 1971); C.A. KENT, *THE ENCYCLOPEDIA FOR ENTREPRENEURSHIP* (Lexington, MA, 1984); Minet Schindehutte et al., *Triggering events, corporate entrepreneurship and the marketing function*, 8 JMTP. 18 (2000).

¹¹¹ See Morris & Trotter, *supra* note 93, at 132 *et seq.*

¹¹² See Srivastava & Agrawal, *supra* note 84.

¹¹³ See Ireland et al., *supra* note 82, at 21 *et seq.*

¹¹⁴ See Harold L. Sirkin et al., *The hard side of change management*, 83 HARVARD BUS. REV. 109 at 112 (2005).

¹¹⁵ See Massimo G. Colombo & Marco Delmastro, *The Determinants of Organizational Change and Structural Inertia: Technological and Organizational Factors*, 11 J. ECON. MANAGE. STRAT. 595, at 596 (2002).

¹¹⁶ See JOHN P. KOTTER, *LEADING CHANGE* (Harvard Business Review Press 1996); Colombo & Delmastro, *supra* note 115, at 596.

¹¹⁷ See Colombo & Delmastro, *supra* note 115.

¹¹⁸ See Michael T. Hannan & John Freeman, *Structural Inertia and Organizational Change*, 49 AM. SOCIOL. REV. 149 (1984); Colombo & Delmastro, *supra* note 115, at 596 *et seq.*

decision making costs as a consequence of uncertainty, another explanation of this phenomenon was brought forward by the behavioralist theorists of organizations.¹¹⁹ Since, under such a setting, there is no guaranty that a change of the organizational structure will be successful, firms often prefer to stick to their current structure, until a very poor performance forces them to change.¹²⁰ Yet another approach in order to explain the phenomenon of “structural inertia” can be found in the necessity to effectively monitor subordinates.¹²¹ The larger a firm’s size, the more levels of hierarchies can be needed in order to ensure a contracted level of effort and working morale of employees.¹²² Especially firms, operating in stable markets, often face a trade-off between a strong focus on cost reduction by relying on a clearly structured, highly hierarchical and effective organization and a rather entrepreneurial focus by relying on decentralization. Hence, there seems to arise a conflict with respect to the creation of the appropriate environment for corporate entrepreneurship on the one side and considerations relating to stability and cost efficiency on the other. This interpretation is further supported by the observation of Morris & Trotter who argue that:

“There is, in fact, a natural tendency for companies to lose the entrepreneurial spirit, and build internal constraints on entrepreneurship, as they evolve through the organizational life cycle.”¹²³

And:

“These systems seek to provide stability, order, and coordination to an increasingly complex internal corporate environment. The trade-off, however, is a strong disincentive for entrepreneurship.”¹²⁴

B. The Ambidextrous Organization

This trade-off is also the essential component of the literature in connection with the idea of an ambidextrous organization.¹²⁵ In this regard, the term ambidexterity, which originally stands for bi-manual, refers to a firm’s capability to successfully combine and balance

¹¹⁹ See JAMES G. MARCH & HERBERT SIMON, *ORGANIZATIONS* (Wiley 1958); RICHARD M. CYERT & JAMES G. MARCH, *A BEHAVIORAL THEORY OF THE FIRM* (Englewood Cliffs 1963); Colombo & Delmastro, *supra* note 115, at 596.

¹²⁰ See Colombo & Delmastro, *supra* note 115, at 596.

¹²¹ See Oliver E. Williamson, *Hierarchical Control and Optimum Firm Size*, 75 J. POLIT. ECON. 123 (1967); Colombo & Delmastro, *supra* note 115, at 600.

¹²² See Yingyi Qian, *Incentives and loss of control in an Optimal Hierarchy*, 61 REV. ECON. STUD. 527 (1994); Colombo & Delmastro, *supra* note 115, at 600.

¹²³ Morris & Trotter, *supra* note 93, at 132.

¹²⁴ *Id.*, at 134.

¹²⁵ See Robert B. Duncan, *The Ambidextrous Organization, Designing Dual Structures for Innovation*, in *THE MANAGEMENT OF ORGANIZATION DESIGN: STRATEGIES AND IMPLEMENTATION* 167 (Ralph H. Kilmann, Louis R. Pondy, Dennis P. Slevin eds., North Holland 1976).

exploration and exploitation strategies.¹²⁶ That is to say, that a firm, in order to secure its long-term success, has to manage both, the exploitation of its current resources and competitive advantages, as well as the exploration of new business opportunities, new resources and the generation of innovations.¹²⁷ However, this requires that firms, on the one hand, have to focus on the improvement of existing routines, structures and technologies in order to realize efficiency gains, quality advantages as well as incremental innovations, and, on the other hand, have to explore the technological search space in order to generate innovations and to find new business opportunities.¹²⁸

To find a balance between these two goals is apparently not an easy undertaking, since many companies have difficulties in pursuing both strategies in parallel (mostly leading them to a dominant focus on exploitation).¹²⁹ Based on these observations, some scholars consequently suspected that there has to be some kind of unavoidable trade-off between exploitation and exploration activities.¹³⁰ Authors who referred to the nature of this trade-off

¹²⁶ See March, *supra* note 61; Levinthal & March, *supra* note 61; Julian Birkinshaw & Cristina B. Gibson, *Building Ambidexterity Into an Organization*, 46 MIT SLOAN MANAGE. REV. 47 (2004); Justin J. P. Jansen et al., *Exploratory Innovation, Exploitative Innovation, and Performance: Effects of Organizational Antecedents and Environmental Moderators*, 52 MANAGE. SCI. 1661 (2006); Charles A. O'Reilly III & Michael L. Tushman, *The Ambidextrous Organization*, 82 HARVARD BUS. REV. 74 (2004).

¹²⁷ See March, *supra* note 61; Mary J. Benner, & Michael L. Tushman, *Exploitation, Exploration and Process Management: The Productivity Dilemma Revisited*, 28 ACAD. MANAGE. REV. 238 (2003); Charles A. O'Reilly III & Michael L. Tushman, *Ambidexterity as a Dynamic Capability: Resolving the Innovator's Dilemma*, 28 RES. ORGAN. BEHAV. 185 at 189 (2008).

¹²⁸ Björn Hobus & Michael W. Busch, *Organizational Ambidexterity*, 71 DIE BETRIEBSWIRTSCHAFT 189, at 189 (2011).

¹²⁹ See, e.g., WILLIAM J. ABERNATHY, *THE PRODUCTIVITY DILEMMA: ROADBLOCK TO INNOVATION IN THE AUTOMOBILE INDUSTRY* (Baltimore, Johns Hopkins University Press 1978); CLAYTON M. CHRISTENSEN, *THE INNOVATOR'S DILEMMA: WHEN NEW TECHNOLOGIES CAUSE GREAT FIRMS TO FAIL* (Boston, Harvard Business School Press 1997); Clayton M. Christensen & Joseph L. Bower, *Customer Power, Strategic Investment, and the Failure of Leading Firms*, 17 STRATEG. MANAGE. J. 197 (1996); Glenn R. Carroll & Albert C. Y. Teo, *Creative Self-Destruction Among Organizations: An Empirical Study of Technical Innovation and Organizational Failure in the American Automobile Industry, 1885-1981*, 5 IND. CORP. CHANGE 619 (1996); Pino G. Audia et al., *The Paradox of Success: An Archival and a Laboratory Study of Strategic Persistence Following Radical Environmental Change*, 43 ACAD. MANAGE. J. 837 (2000); James G. March, *Understanding Organisational Adaptation*, 25 SOCIETY AND ECONOMY 1, at 5 (2003); Charles W. L. Hill & Frank T. Rothaermel, *The Performance of Incumbent Firms in the Face of Radical Technological Innovation*, 28 ACAD. MANAGE. REV. 257 (2003); ANDREW CAMPBELL & ROBERT PARK, *THE GROWTH GAMBLE: WHEN LEADERS SHOULD BET BIG ON NEW BUSINESSES AND HOW TO AVOID EXPENSIVE FAILURES* (London and Naperville, Nicholas Brealey Publishing 2005); Sebastian Raisch & Florian Hotz, *Shaping the Context for Learning: Corporate Alignment Initiatives, Environmental Munificence and Firm Performance*, in STRATEGIC RECONFIGURATIONS: BUILDING DYNAMIC CAPABILITIES IN RAPID INNOVATION-BASED INDUSTRIES 62, at 65 (Stuart Wall ed., Cheltenham, Edward Elgar Publishing 2010).

¹³⁰ See, e.g., JAMES D. THOMPSON, *ORGANIZATIONS IN ACTION: SOCIAL SCIENCE BASES OF ADMINISTRATIVE THEORY* (New Brunswick, Transaction Publishers 1967); Abernathy, *supra* note 129; Benner & Tushman, *supra* note 127; Christensen, *supra* note 129; March, *supra* note 61; Levinthal & March, *supra* note 61; Michael L. Tushman & Charles A. O'Reilly III (1996), *Ambidextrous Organizations: Managing Evolutionary and Revolutionary Change*, 38 CALIF. MANAGE. REV. 8 (1996); David J. Teece et al., *Dynamic Capabilities and Strategic Management*, 18 STRAT. MGMT. J. 509 (1997); Paul S. Adler et al., *Flexibility versus Efficiency? A Case Study of Model Changeovers in the Toyota Production System*, 10 ORGAN. SCI. 43 (1999); Willow A. Sheremata, *Centrifugal and Centripetal Forces in Radical New Product Development Under Time Pressure*, 25 ACAD. MANAGE. REV. 389 (2000).

depicted e.g. that pursuing either an exploitation - or exploration strategy requires fundamentally opposing sets of roles, incentives, culture and competences which hardly fit together within the same entity.¹³¹ In particular, explorative activities are considered as processes which succeed by experimenting and should therefore be carried out in small and decentralized units.¹³² Exploitation, however, requires rather large and centralized entities with tight cultures and processes.¹³³ Benner & Tushman stated moreover, that even the diffusion of process management techniques as “Total Quality Management” (TQM), “Six Sigma” or the “International Organization for Standardization’s Series 9000” (ISO 9000) promoted exploitative innovations at the expense of explorative innovations, thereby indicating that both activities indeed cannot coexist in the same business unit.¹³⁴ As a consequence, closely tied to the question relating to the compatibility of exploitation and exploration is the question with respect to the appropriate organizational structure for simultaneously pursuing these strategies on a corporate level. As a solution to this trade-off, some authors proposed to separate these activities from one another, whereas “[...] the tasks, culture, individuals, and organizational arrangements are consistent [within subunits], but across subunits tasks and cultures are inconsistent and loosely coupled”.¹³⁵ Hence, the separation of the units with explorative tasks from the parent firm, and therefore also the degree of decentralization, in terms of organizational structure and autonomy, is often understood as the key element of success for achieving ambidexterity. This creation of separate structures for exploration and exploitation within one firm became known as structural ambidexterity.¹³⁶ Others, however, consider these strategies as basically compatible, providing that they are pursued within an adequate organizational design.¹³⁷ This approach, often called contextual ambidexterity, focuses on individuals to make choices between exploitation and exploration oriented tasks.¹³⁸ Consequently, employees are expected to

¹³¹ See Michael L. Tushman et al., *Organizational Designs and Innovation Streams*, 19 IND. CORP. CHANGE. 1331, at 1335 (2010).

¹³² See Benner & Tushman, *supra* note 127, at 247; O'Reilly III & Tushman, *supra* note 127, at 189; Nicolaj Siggelkow & Daniel A. Levinthal, *Temporarily Divide to Conquer: Centralized, Decentralized, and Reintegrated Organizational Approaches to Exploration and Adaptation*, 14 ORGAN. SCI. 650 (2003).

¹³³ See Benner & Tushman, *supra* note 127, at 247.

¹³⁴ *Id.*, at 239.

¹³⁵ *Id.*, at 247.

¹³⁶ See Adler et al., *supra* note 130; Edward F. McDonough & Richard Leifer, *Using Simultaneous Structures to Cope with Uncertainty*, 26 ACAD. MANAGE. J. 727 (1983).

¹³⁷ See Anil K. Gupta et al., *The Interplay Between Exploration and Exploitation*, 49 ACAD. MANAGE. J. 693, at 695 (2006); Cristina B. Gibson & Julian Birkinshaw, *The Antecedents, Consequences and Mediating Role of Organizational Ambidexterity*, 47 ACAD. MANAGE. J. 209, at 221 (2004).

¹³⁸ See Gibson & Birkinshaw, *supra* note 137; Ian P. McCarthy & Brian R. Gordon, *Achieving Contextual Ambidexterity in R&D Organizations: A Management Control System Approach*, 41 R&D MANAGE. 240 (2011).

divide their work time according to the two activities so that they can also experiment with breakthrough ideas.

Hence, this general tension between exploitation and exploration, which is deemed to determine a firm's long-term success, provides the theoretical background for the following analysis of the firms' incentives to maintain "diversity" in-house post-merger. While Corporate Entrepreneurship can be considered as an approach which reconciles exploitation and exploration strategies through the creation of independently operating business-units for exploration purposes¹³⁹, the post-merger literature can be linked to the question whether firms consider the direct maintenance of a target firm's autonomy post-merger. Therefore, in the following we will analyze the post-merger integration literature in order to find out how and to what extent the preservation of "diversity" is considered against this background.

C. Post-merger integration literature

The literature on post-merger integration is familiar with the problem that the merging parties have to decide whether they want to exploit the newly gained resources and assets by structural integration or whether they should rather maintain the autonomy of the firms in order to enable continued innovation.¹⁴⁰ In this context, structural integration is understood as: "[...] the alignment and standardization of processes and systems, common hierarchical control, cross-unit teams, and integrating managers [...]."¹⁴¹ It is argued that integration can benefit exploitation by offering substantial potential for synergies by realizing e.g. economies of scale and scope¹⁴², or by improving a firm's capability to turn inventions into innovations.¹⁴³ This improvement can be explained by an enhanced coordination through e.g. common processes, authority and incentive systems, as well as informal communication channels, a common language, group conventions and group identity.¹⁴⁴ However, it is also

¹³⁹ See Max Keilbach & Mark Sanders, *Exploration and Exploitation: The Role of Entrepreneurship and R&D in the Process of Innovation*, 108 JENA ECONOMIC RESEARCH PAPERS (2007), available at <http://hdl.handle.net/10419/25680> (Okt. 14, 2013).

¹⁴⁰ See PHILIPPE C. HASPELAGH & DAVID B. JEMISON, *MANAGING ACQUISITIONS: CREATING VALUE THROUGH CORPORATE RENEWAL* (New York, Free Press 1991); Phanish Puranam et al., *Organizing for Innovation: Managing the Coordination-Autonomy Dilemma in Technology Acquisitions*, 49 ACAD. MANAGE. J. 263 (2006).

¹⁴¹ Puranam et al., *supra* note 140 at 264.

¹⁴² See Constance E. Helfat & Kathleen M. Eisenhardt, *Inter-Temporal Economies of Scope, Organizational Modularity, and the Dynamics of Diversification*, 25 STRATEG. MANAGE. J. 1217 (2004).

¹⁴³ See Shona L. Brown & Kathleen M. Eisenhardt, *Product Development: Past Research, Present Findings, and Future Directions*, 20 ACAD. MANAGE. REV. 343 (1995); Shaker A. Zahra & Anders P. Nielsen, *Sources of Capabilities, Integration and Technology Commercialization*, 23 STRATEG. MANAGE. J. 377 (2002).

¹⁴⁴ See Puranam et al., *supra* note 140 at 265; Bruce Kogut & Udo Zander, *What Firms Do? Coordination, Identity, and Learning*, 7 ORGAN. SCI. 502 (1996); Herminia Ibarra, *Network Centrality, Power, and Innovation Involvement: Determinants of Technical and Administrative Roles*, 36 Acad. Manage. J. 471

acknowledged that structural integration can disrupt a firms' capability for continued innovation which would therefore be detrimental for exploration strategies.¹⁴⁵ Benner & Tushman¹⁴⁶ as well as Ranft & Lord¹⁴⁷, among others, pointed out that integration will inevitably alter the organizational routines and processes of the acquired firm (by making it similar to the acquirer), which will consequently lead to a loss of the firm's identity and can diminish its capabilities to innovate.¹⁴⁸

Thus, whilst centralization, control and structural integration is mostly understood as being beneficial for the exploitation of current resources,¹⁴⁹ decentralization and autonomy are often expected to be favorable for pursuing an exploration strategy.¹⁵⁰ As possible solutions to this "coordination-autonomy dilemma"¹⁵¹, the literature basically offers two different approaches. Firstly, some authors proposed that an acquired firm could initially maintain its autonomy until it is integrated into the acquiring firm at a later point in time.¹⁵² However, the major shortcoming of these proposals is that the date, by which the acquired firm ought to be integrated, remains unspecified. Secondly, Puranam, Singh & Zollo¹⁵³ recently offered an approach that relies on the progress of the underlying technological trajectory.¹⁵⁴ In order to avoid any disturbance of its innovative capacity, the authors proposed that an acquiring firm should refrain from integrating the target firm when it is situated at the beginning of a

(1993); Colin F. Camerer & Marc Knez, *Coordination, Organizational Boundaries and Fads in Business Practices*, 5 IND. CORP. CHANGE 89 (1996).

¹⁴⁵ See Haspeslagh & Jamison, *supra* note 140 at 148; Annette L. Ranft & Michael D. Lord, *Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation*, 13 ORGAN. SCI. 420 (2002); PHANISH PURANAM, *GRAFTING INNOVATION: THE ACQUISITION OF ENTREPRENEURIAL FIRMS BY ESTABLISHED FIRMS* (Ann Arbor, University Microfilms International 2001).

¹⁴⁶ See Benner & Tushman, *supra* note 127.

¹⁴⁷ See Ranft & Lord, *supra* note 145.

¹⁴⁸ See Puranam et al., *supra* note 140 at 265; Haspeslagh & Jamison, *supra* note 140 at 148.

¹⁴⁹ See Raisch & Hotz, *supra* note 129 at 65; Puranam et al., *supra* note 140 at 264; Duncan, *supra* note 125; ROBERT E. QUINN & KIM S. CAMERON, *PARADOX AND TRANSFORMATION: TOWARD A THEORY OF CHANGE IN ORGANIZATION AND MANAGEMENT* (Cambridge, Ballinger Publishing 1988).

¹⁵⁰ See Raisch & Hotz, *supra* note 129 at 65; KARL E. WEICK, *THE SOCIAL PSYCHOLOGY OF ORGANIZING* (Random House 1979); STEVEN C. WHEELWRIGHT & KIM B. CLARK, *REVOLUTIONIZING PRODUCT DEVELOPMENT: QUANTUM LEAPS IN SPEED, EFFICIENCY, AND QUALITY* (Free Press 1992); CLAYTON M. CHRISTENSEN & MICHAEL E. RAYNOR, *THE INNOVATOR'S SOLUTION: CREATING AND SUSTAINING SUCCESSFUL GROWTH* (Boston, Harvard Business School Press 2003); RICHARD LEIFER ET AL., *RADICAL INNOVATION: HOW MATURE COMPANIES CAN OUTSMART UPSTARTS* (Boston, Harvard Business School Press 2000); Constantinos Markides, *Strategic Innovation in Established Companies*, 39 MIT SLOAN MANAGE. REV. 31 (1998).

¹⁵¹ *Id.*

¹⁵² See Julian Birkinshaw et al., *Managing The Post-Acquisition Integration Process: How the Human Integration and Task Integration Processes Interact to Foster Value Creation*, 37 J. MANAGE. STUD. 395 (2000); Haspeslagh & Jamison, *supra* note 140; Ranft & Lord, *supra* note 145.

¹⁵³ See Puranam et al., *supra* note 140.

¹⁵⁴ See Giovanni Dosi, *Technological paradigms and Technological Trajectories: A Suggested Interpretation of the Determinants and Directions of Technical Change*, 11 RES. POLICY 147 (1982); Sidney G. Winter, *Schumpeterian Competition in Alternative Technological Regimes*, 5 J. ECON. BEHAV. ORGAN. 287 (1984).

technological trajectory.¹⁵⁵ However, whenever the technological paradigm appears to be in an already advanced stage, the negative consequences of structural integration were considered as less harmful.¹⁵⁶

As a consequence, the arguments in favor of maintaining autonomy correspond very well to both aspects of our concept of “intra-firm diversity”. On the one hand it can be understood as an attempt to secure “diversity” in the sense of business units as independent sources for the generation of innovations and the identification of new business opportunities. On the other hand it is also in line with our second notion of “diversity” which focused on enabling an acquired entity to continue with its current innovation efforts without being influenced and interrupted by the acquirer and to avoid an alignment of so far different R&D tracks.

However, even though considerations about the benefits of “intra-firm diversity”, by relying on autonomy for exploration purposes, apparently play a substantial role for scholars and practitioners who work in the field of post-merger integration, there are still significant incentives for structural integration in order to exploit current resources. This holds particularly true for large transactions. Since the majority of the contributions cited in this chapter on post-merger integration dealt with technology acquisitions of small innovative firms, the opportunity costs of preserving a target firm’s autonomy can be expected to be comparatively low. However, the larger the transaction, the higher is the potential to benefit from the exploitation of the newly gained resources and to achieve economies of scope. As a consequence, it is questionable whether private and social incentives (measured in consumer welfare) about the preservation of “diversity” after a merger do always coincide. This holds particularly true, whenever the benefits from exploiting the target firm are not passed on to consumers in the form of price-cuttings or significant product improvements, but become manifest predominantly in an increase in the firm’s profits. Hence, there can emerge situations in which an acquirer prefers structural integration and thus the exploitation of the target firm in order to increase its current profits, while consumers would favor to maintain the acquired firm’s autonomy in order to uphold the capacity for the generation of innovations. Besides this, March furthermore suspected that: “[E]stablished organizations will always specialize in exploitation, in becoming more efficient in using what they already know”.¹⁵⁷ And O’Reilly & Tushman added: “In contrast, returns to exploration are more uncertain, more distant in time, and sometimes a threat to existing organizational units”.¹⁵⁸

¹⁵⁵ See Puranam et al., *supra* note 140.

¹⁵⁶ *Id.*

¹⁵⁷ March, *supra* note 129 at 14.

¹⁵⁸ O’Reilly III & Tushman, *supra* note 127 at 189.

These doubts are further reinforced by empirical studies which generally analyzed the impact of mergers and acquisitions on innovation. Even though these studies do not explicitly consider the impact of autonomy/integration on innovation, their findings still give food for thought. In their survey article on the empirical literature regarding the impact of M&A on the post-merger innovativeness of firms, De Man and Duysters¹⁵⁹ could not find any significant positive effect of mergers and acquisitions on the innovativeness of the respective firms. The explanations put forward in line with this phenomenon vary from an assumed scarcity of financial resources for R&D as a consequence of the executed transaction¹⁶⁰, integration problems¹⁶¹, to an overestimation of short-term financial targets over long-term strategic goals by managers¹⁶². However, besides this, it can also be suggested that the observed negative effects of mergers on innovation stem, at least to some extent, also from an inordinate focus on exploitation strategies which sacrifice autonomy, and thereby the innovative capacity of the acquired firm, to structural integration.

IV. CONCLUSION

It is outstanding that many scholars, who can be associated with the disciplines of strategic management and organizational science, are obviously highly interested in the impact of a decentralized organizational structure and autonomy on the innovativeness and general performance of firms. Thus, the extensive literature analyzed in this article indicates above all that decentralized and independently operating business units, which possess a wide scope of decision-making and action as well as responsibility for their own budget, indeed foster innovation. Therefore, it can be derived that “diversity”, irrespective of the fact whether it can be found in-house or in the competition process among firms, apparently matters.

Based on the richness of the introduced literature one might thus conclude that even merged entities should have an incentive to create/maintain “diversity” in-house and thereby balance a merger induced reduction of “inter-firm-diversity” by an increased “intra-firm-diversity”. However, we also discovered that the creation of “intra-firm-diversity” is a very

¹⁵⁹ See Ard-Pieter De Man & Geert Duysters, *Collaboration and Innovation: A Review of the Effects of Mergers, Acquisitions and Alliances on Innovation*, 25 *TECHNOVATION* 1377 (2005).

¹⁶⁰ See Michael A. Hitt et al., *The Market for Corporate Control and Firm Innovation*, 39 *ACAD. MANAGE. J.* 1084, at 1089 (1996); Bronwyn H. Hall et al., *The Impact of Corporate Restructuring on Industrial Research and Development*, 3 *BROOKINGS PAP. ECO. AC.* 85 at 113 (1990).

¹⁶¹ See Wesley M. Cohen & Daniel A. Levinthal, *Innovation and Learning: The two Faces of R&D*, 99 *ECON. J.* 569 (1989); Ashish Arora & Alfonso Gambardella, *Complementarity and External Linkages: The Strategies of the Large Firms in Biotechnology*, 38 *J. IND. ECON.* 361 (1990); Udo Zander & Bruce Kogut, *Knowledge and the Speed of the Transfer and Imitation of Organizational Capabilities: An Empirical Test*, 6 *ORAN. SCI.* 76 (1995); Teece et al., *supra* note 130.

¹⁶² See Andrew D. James et al., *Integrating Technology into Merger and Acquisition Decision Making*, 18 *TECHNOVATION* 563 at 566 (1998).

ambitious undertaking which demands that numerous requirements are fulfilled and which furthermore often tends to fail. Besides this, we depicted that the preservation of “diversity”, either as a consequence of a newly created “intra-firm diversity”, or because of a direct maintenance of an acquired firm’s autonomy, cannot be realized without (opportunity) costs. Hence, the firms will most likely face a trade-off between the creation/maintenance of “diversity” for the improvement of their innovative capacity on the one hand and integration and centralization for the exploitation of current resources and the realization of cost-saving potentials on the other. As a result, we can neither conclude that the degree of “diversity”, which existed before a certain merger takes place, will inevitably get lost, nor that it will definitely be upheld post-merger. However, apart from the difficulties in line with the creation of “diversity” in-house, we also found evidence that firms tend to have a predominant focus on exploitation goals at the expense of exploration objectives. Hence, we have good reason to reject the presumption that merging firms will definitely preserve an efficient level of “diversity” post-merger.

What conclusions can be drawn from a competition policy perspective? Does the fact that the successful implementation of “intra-firm-diversity” is apparently not an easy task and that firms tend to overvalue exploitation objectives provide ample reasons for an intervention of antitrust agencies in the review process of mergers? Can mergers and acquisitions themselves not be understood as a process of experimentation on an organizational level and therefore as an inherent part of the overall evolutionary process of trial and error in which only the best solutions and most capable firms will prevail? Shouldn’t firms that have the capability to successfully implement “intra-firm-diversity” be rewarded by a higher innovativeness and a superior performance while the firms that lack these capabilities would simply disappear? Hence, it can be questioned why competition authorities should protect “inter-firm diversity” with the ultimate goal that a variety of sources for the generation of future innovations is secured and parallel experimentation is rendered possible, while they restrain the experimental process on the organizational level at the same time.

These are serious questions and should be subject to further research. However, a crucial precondition for our considerations about the protection of “diversity” in merger review was the existence of significant entry barriers for the participation in the process of innovation competition. These kinds of entry barriers became known under the term “specialized assets”¹⁶³ and are considered as assets which are indispensable, as well as difficult to acquire and adopt, for the generation of innovations in a certain field. As a consequence, whenever

¹⁶³ See Gilbert & Sunshine, *supra* note 1.

competition authorities fail to identify such “specialized assets”, a loss of “diversity” should simply get balanced by new entrants – regardless of whether the merging parties succeed or fail to create/maintain “diversity” in-house. However, whenever these entry barriers are high and the competitive structure is furthermore already highly concentrated, the assessment becomes more delicate. Under such a setting it can indeed be advisable to challenge a certain transaction and thus suppress the process of experimentation on an organizational level in order to protect “inter-firm-diversity” and thereby the process of parallel experimentation as well as potential sources for future innovations.¹⁶⁴

¹⁶⁴ For a further discussion, especially with respect to the trade-off between the benefits of “diversity” on the one hand and possible efficiency gains on the other, *see* Cohen & Klepper, *supra* note 39.

Essay IV:

Empirical Analysis of the Assessment of Innovation Effects in U.S. Merger Cases

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Status:

Working Paper

MAGKS - JOINT DISCUSSION PAPER SERIES IN ECONOMICS, NO.50-2014 (2014)

Eingereicht:

JOURNAL OF LAW AND ECONOMICS
(derzeit unter Begutachtung)

Vorge stellt auf:

EALE 2014 (European Association of Law and Economics), Aix-en-Provence
41. Hohenheimer Oberseminar 2013, Stuttgart
IIDEOS PhD Week 2013, Marburg

MAGKS



**Joint Discussion Paper
Series in Economics**

by the Universities of
**Aachen · Gießen · Göttingen
Kassel · Marburg · Siegen**

ISSN 1867-3678

No. 50-2014

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This paper can be downloaded from
http://www.uni-marburg.de/fb02/makro/forschung/magkspapers/index_html%28magks%29

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EMPIRICAL ANALYSIS OF THE ASSESSMENT OF INNOVATION EFFECTS IN U.S. MERGER CASES

Benjamin R. Kern ^{*}, Ralf Dewenter [#], Wolfgang Kerber ⁺

(August 12, 2014)

ABSTRACT

In this empirical study all mergers that have been challenged by the U.S. antitrust agencies FTC and DOJ between 1995 and 2008 were analyzed in regard to the question to what extent and how the agencies assessed the innovation effects of mergers. Theoretical background is the still open question how negative effects of mergers on innovation should be taken into account in merger policy. Although we can show in our study that in one third of all challenged mergers also innovation concerns were raised, the results also point to a still existing large degree of uneasiness and inconsistencies of the agencies in regard to the assessment of innovation effects. A particularly interesting result is that - despite the wide-spread rejection of the "innovation market approach" in the antitrust debate - the agencies used more an innovation-specific assessment approach that includes also innovation in the market definition than the pure traditional product market concept. Additionally, we also found significant differences between the assessment approaches of the FTC and the DOJ.

JEL: K21, L12, L41, O31

Keywords: innovation, merger policy, US antitrust, innovation market

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1. Introduction

Despite the consensus that competition policy should also protect innovation competition, it is still very unclear whether and how competition authorities should take innovation effects into account. This is particularly true for merger policy, where the growing emphasis on case-specific economic analysis has led to a greater focus on the assessment of short-term price effects of mergers, whereas the potentially negative effects on consumer welfare through less innovation are in danger of being ignored. This asymmetry can also be seen very clearly in the Horizontal Merger Guidelines both of the EU and the U.S., in which innovation effects of mergers play only a small role (EU Commission 2004, DOJ/FTC 2010). One important reason is the uncertainty of competition authorities (as well as lawyers and economists) about how innovation effects of mergers can and should be assessed (for an overview about the discussion Katz/Shelanski 2007). A crucial part of the problem concerns a basic conceptual issue: Is the traditional approach of first defining product markets and subsequently analyzing the anticompetitive effects of a merger on these markets also suitable for assessing innovation effects of mergers or is it necessary to use a more innovation-specific assessment approach?

In the U.S., this question led to the development of the Innovation Market Analysis (IMA) as a new approach for the assessment of innovation effects in antitrust law in the mid 1990s (Gilbert/Sunshine 1995). The problems with the traditional product market approach are, firstly, that the competitors in regard to the innovation of new products might not be identical with the competitors in a traditional product market, as some incumbent firms might not innovate or also non-incumbent firms might take part in innovation competition. Secondly, market shares and concentration levels on product markets might not be good indicators for assessing the effectiveness of innovation competition. Therefore, the basic idea of the innovation market analysis focusses on a direct identification of the relevant innovation competitors by asking for the firms that have the necessary resources for innovation (in form of specialized assets), leading to so-called innovation markets. Subsequently, it is asked whether a merger would lead to negative effects on innovation, i.e. by delaying or reducing investment in R&D (with the possibility of balancing anticompetitive effects with efficiency effects).

This new approach of the innovation market analysis had been criticized vigorously from its beginning. The major points of criticism were that a new concept is not necessary (claiming that the traditional concepts are sufficient) and that such an analysis is unfeasible, given our

limited knowledge about the innovation effects of mergers.¹ Nevertheless, and despite this critique, the innovation market analysis appears to have influenced considerably U.S. antitrust policy. One important application was the explicit inclusion of the concept of innovation markets in the "Antitrust Guidelines for the Licensing of Intellectual Property" in 1995 (DOJ/FTC 1995). At the same time, a considerable increase of concerns in regard to innovation effects in the merger reviews of U.S. antitrust authorities can be observed (Gilbert 2008a). However, afterwards the support for the innovation market analysis in the academic discussion has waned dramatically. This has become evident in the discussion about the reform of the U.S. Horizontal Merger Guidelines (DOJ/FTC 2010) with its mixture of broad support for assessing innovation effects in merger analysis but its rejection of recommending the innovation market analysis.²

The objective of our paper is an empirical analysis to what extent and how the U.S. antitrust authorities, i.e. the Federal Trade Commission (FTC) and the Department of Justice (DOJ), took account of negative innovation effects in their assessments of mergers. Although the EU merger policy also considered innovation effects to some extent, the U.S. experiences with the assessment of innovation effects in merger reviews is much richer and more interesting, because the innovation market discussion allowed for a more explicit experimentation with new assessment approaches. In our empirical analysis, we have examined all 399 mergers that were challenged by the FTC and DOJ between 1995 and 2008.³ Our sources are the "complaints", "decision and orders", "final judgments", etc. By analyzing all 399 complaints in these cases, we could identify a sub-sample of 135 merger cases, in which innovation concerns have been investigated explicitly (FTC: 91, DOJ: 44). Therefore, in the U.S., a large number of relevant cases exists. In addition to that, the innovation concerns of the agencies also led to a considerable number of settlements with structural remedies. These settlements required the merging firms to far-reaching divestitures, especially in regard to parallel R&D projects, which had to be sold to competing firms in order to maintain innovation competition (for an overview see, e.g., Carrier 2008).

¹ See for a critical discussion, e.g., Rapp (1995), Lang (1997), Morse (2001), Carlton/ Gertner (2003), Davis (2003), Kent (2011); see for a more balanced perspective Katz/Shelanski (2007, 41-44), Carrier (2008), and Kern (2014).

² The respective public comments and records of the FTC/DOJ joint workshops can be found on: <http://www.ftc.gov/news-events/events-calendar/2010/01/horizontal-merger-guidelines-review-project-0> (Aug. 14, 2014).

³ See the "Annual Competition Enforcement Reports to Congress" of the agencies between the fiscal year 1995 and fiscal year 2008.

Although there is considerable literature on merger cases with respect to innovation aspects, which analyze particular cases in a qualitative way,⁴ only Gilbert (2008a) has so far analyzed cases also quantitatively. Our study is the first econometric study about the question how the U.S. merger policy assessed innovation effects of mergers. In comparison to Gilbert (2008a), our study encompasses more cases due to a longer investigation period (1995 - 2008) but also focusses not only on the question to what extent but also *how* the U.S. agencies assessed innovation effects of mergers. Additionally, we also ask whether the two agencies FTC and DOJ used the same or different assessment approaches in regard to innovation effects of mergers, and whether we can observe developments during our investigation period 1995 - 2008 in regard to these assessments.⁵

The first part of our empirical study (in section 2) focusses on the extent the antitrust agencies took innovation concerns into account. How important were innovation concerns? Under what circumstances did the agencies assess a merger also in regard to innovation effects? Were there differences between the agencies? Our results will show that in a third of all challenged merger cases the agencies also raised innovation concerns, and in this regard we also could not find significant differences between the agencies or a change during the entire period. We can also show that the probability that the agencies assess innovation concerns increases with the innovativeness of the industry of the merging firms.

In the following sections 3 and 4, we examine how the FTC and the DOJ assessed innovation effects in particular. This analysis takes place on the level of markets. Section 3 addresses the crucial question whether the agencies try to assess innovation effects more within the traditional approach of defining product markets, and only investigate negative effects on innovation in the ensuing competitive assessment, or whether they use a newer, more innovation-specific approach, which already considers innovation in the market definition. We will see that in a large number of markets, innovation was explicitly taken into account already in the market definition, and not only in the competitive assessment analysis. Our results will also show that both assessment approaches were used by both agencies, however, to a significantly

⁴ See, e.g., Davis (2003), Morse (2001), Rubinfeld/Hoven (2001), Landman (1999), Katz/Shelanski (2007), Carrier (2008), Kern (2014).

⁵ Whereas this paper presents the econometric results of our study, a broader discussion of these (and additional) results within the context of the theoretical and empirical knowledge about innovation effects of mergers and the recent discussion in U.S. antitrust policy can be found in Kerber/Kern (2014)

different extent. It is particularly interesting that the FTC used more an innovation-specific approach than the DOJ in regard to market definition, whereas the DOJ stuck more to the traditional product market approach. Other empirical questions refer to the extent of the use of conventional (market shares, HHI) or more innovation-specific concentration measures (number of firms).

The last part of our empirical study (in section 4) analyzes the theoretical reasonings the agencies gave why the mergers might have negative effects on innovation. We investigate not only what kind of theoretical reasonings have been mentioned (e.g., innovation incentives or diversity arguments), but also to what extent the agencies provided specific arguments at all. Although increasingly innovation incentive arguments were used, the results will show that in more than 50% of all assessed markets the agencies gave no specific reasons for their alleged innovation concerns (particularly the FTC). A surprising result is that increasingly the agencies (and in particular the DOJ) also claimed static price effects in those markets, in which they had innovation concerns. In combination with the high share of cases without specific reasonings, this outcome raises critical questions about the quality and development of the policies of the agencies in regard to the assessment of innovation effects in merger cases. Our concluding section 5 will integrate the results of all three parts of the empirical study, discuss and relate these critical questions to the recent reform discussion of the Horizontal Merger Guidelines, and give some hints for further research.

2. Extent of Assessing Innovation Effects in U.S. Merger Policy

2.1 Hypotheses

How often and under what circumstances did the U.S. agencies investigate mergers not only in regard to price effects but also in regard to negative effects on innovation as another possibility how consumers can be harmed? For our empirical analysis, we consider a merger case as an innovation merger case, whenever the agencies have mentioned in the "complaint" innovation aspects in at least one market, either in the market definition or in the competitive assessment. Typical wordings, indicating that innovation is considered in the market definition, are provided by terms like "the research, development, manufacture and sale of [...]", whereas a consideration of innovation effects within the competitive assessments is shown through explicitly claimed anticompetitive innovation effects. For identifying an innovation

merger case, it was sufficient that such innovation aspects were mentioned in at least one of the investigated markets.

From the overall 399 merger challenges of the FTC and DOJ between 1995 and 2008, we identified 135 mergers, in which the agencies have mentioned innovation aspects in either the market definition and/or anticompetitive effects (FTC: 91; DOJ: 44; see Table 1). In this subsample of 135 cases, the agencies have analysed 341 different markets. After excluding 18 markets, in which only concerns in regard to price increases were raised, we received a second subsample, consisting of 323 analyzed markets (FTC: 218; DOJ: 105), in which innovation aspects were mentioned (either in the market definition or in the anticompetitive effects or in both).⁶ Whereas our analysis in this section focusses entirely on the case level (by investigating the 135 innovation merger cases in comparison to all 399 challenged mergers), our analyses *how* the agencies assessed these innovation effects (sections 3 and 4), are carried out on the market level and therefore use the subsample of the 323 markets with innovation aspects.

What makes a merger case an innovation merger case in U.S. merger policy? When can one expect that antitrust agencies have concerns about negative innovation effects of mergers? It can be presumed that in high technology industries, in which innovation activities are particularly important, more concerns about innovation effects will be raised than in other industries, which can be characterized by a lower relevance of innovation. Therefore, our first hypothesis is that mergers in more innovative industries will be assessed more often in regard to innovation effects (see Gilbert 2008a). A rejection of this hypothesis would raise critical questions about the appropriateness of the selection of cases for assessing innovation effects by the anti-trust agencies.

H 1.1: It is more likely that the FTC and DOJ consider negative effects on innovation when mergers take place in innovation-intensive industries.

Since both agencies are in the same way authorized for merger reviews, we expect that no systematic differences between both agencies should be observed in regard to assessing innovation effects. However, there are also strong arguments why one could suspect that there are still remarkable differences with respect to the way how they assess mergers. Apart from the

⁶ Please note that we do not call these markets innovation markets, because they need not be identical with how the innovation market approach would define innovation markets.

fact that the two agencies are composed differently (the DOJ as a part of the Administration and the FTC with a bipartisan mixture of Commissioners), some scholars also claimed that the Department of Justice and the Federal Trade Commission do generally differ with respect to their skill sets, cultures, and capabilities. However, experience shows that the agencies have developed some kind of division of labour in regard to merger reviews. Although there are no legally binding rules about which agency scrutinizes what kind of mergers, in certain industries mergers are mostly assessed by the FTC, whereas in other industries this is done by the DOJ.⁷ As a consequence, it is necessary to control for these effects by using the industry classification as control variable.

H 1.2: There are no differences between the FTC and DOJ in regard to the probability that innovation effects are taken into account.

Can we identify changes within the time span of 1995 to 2008 in regard to the question whether the agencies did consider innovation aspects in merger reviews? In his empirical analysis, Gilbert (2008a) divided his observed period from 1990 to 2003 into three sub-periods 1990-1994, 1995-1999, and 2000-2003. The study of Gilbert showed clearly that innovation effects of mergers played only a negligible role in the time before the Innovation Market Analysis was introduced in 1995. We decided for a simpler, two-period approach. The reason is that since the end of the 1990s an ever-increasing critique can be observed in regard to the application of the innovation market analysis, leading to claims that the *Genzyme/Novazyme* landmark decision of the FTC in January 2004, in which the FTC did not challenge a 2:1 merger in regard to the development of a specific drug, might have been the result of a changing attitude towards the assessment of innovation effects of mergers (Muris 2004, Balto/Sher 2004, Gilbert 2008b, Rosch 2009). Hence, we decided to use the sub-periods 1995-2003 and 2004-2008. Our hypothesis is that the agencies challenged fewer mergers on the basis of innovation concerns since 2004 than before.

H 1.3: The probability that innovation effects are claimed is lower for mergers that fall into the period 2004-2008 compared to those falling in the period 1995-2003.

⁷ See for this discussion Maria Barroso Gomes (2013), Carroll (2009), Blumenthal (2013), Memorandum (2002).

2.2. Data and Empirical Model

For analyzing the determinants of merger cases being investigated for innovation effects, we defined a dummy variable (INNOV_CASE) which is equal to unity when innovation aspects were mentioned in the complaint and zero otherwise. Our first set of explanatory variables encompasses the innovativeness of the industry. By using the variables HITEC 0 - HITEC 5 we accounted for the different degrees of technology intensity of the relevant industries. In this respect we follow Peneder (2010) in order to classify the industries of our sample into “Low” (HITEC 1), “Med-low” (HITEC 2), “Med” (HITEC 3), “Med-high” (HITEC 4) and “High” (HITEC 5) technology industries, according to their 2-digit ISIC/NACE denotation (Table A-1 in the appendix). The dummy HITEC 0 captures all industries which were not part of Peneder’s taxonomy but were characterized by much less innovative activity than HITEC 1-industries.⁸ In order to obtain the ISIC/NACE number for the merger cases of our sample we used the relevant markets as they were defined in the complaints.⁹ The Dummy FTC, which is equal to one for FTC cases and zero for DOJ cases, indicates whether a case was challenged by the FTC or the DOJ. We also defined a dummy variable D04-08, which is set equal to unity whenever the respective case was challenged in the period 2004 - 2008.

In order to test our hypotheses 1.1 - 1.3, we used probit¹⁰ techniques by regressing the INNOV_CASE dummy on the explanatory variables: FTC, the time period (D04-08), and the technological intenseness of the industries (HITEC 1 to HITEC 5). Next, we built several industry dummies as controls to account for possible heterogeneity induced by different industries. For this purpose, we used the classification scheme of the FTC (according to the FTC Competition Enforcement Database¹¹), with which the agency classified each of its actions

⁸ According to the 2-digit ISIC/NACE, HITEC 0 encompasses “construction” (45), “sale, maintenance and repair of motor vehicles” (50), “retail trade, except of motor vehicles” (52), “hotels and restaurants” (55), “real estate activities” (70), “renting of machinery and equipment” (71), “public administration and defense” (75), “Education” (80), “health and social work” (85), “sewage and refuse disposal, sanitation and similar activities” (90), “activities of membership organizations n.e.c.” (91), “recreational, cultural and sporting activities” (92), “other service activities” (93), “private households with employed persons” (95), “extra-territorial organizations and bodies” (99).

⁹ Thereby we avoided possible biases as a consequence of the usage of, e.g., firm primary codes and safeguarded that we assign each merger case the appropriate industry classification number (on a 4-digit level) from an antitrust perspective.

¹⁰ As our left hand side variable INNOV_CASE is binary the application of OLS yields inefficient estimates. We therefore used probit models for all our regressions. We also used logit techniques and linear probability models in order to check for robustness. Overall, the results did not change qualitatively throughout the analysis in dependence of the respective method used.

¹¹ For a detailed overview *see* <http://www.ftc.gov/enforcement/cases-proceedings> (Aug. 14, 2014).

into one of seven main categories (Defense, Energy, Health Care, Information and Technology, Manufacturing, Professional Services and Retail), and into 28 subcategories. Since our sample does not entail cases from all the industries, we end up with a maximum of 16 industry classes (see Table A-2 in the appendix).

2.3 Results

In a first step we report the absolute and relative frequencies of innovation cases challenged by FTC and DOJ. As can be seen from Table 1 the agencies have analysed innovation aspects in 135 of the 399 challenged merger cases over the entire period, i.e., in 34% of all cases.

Table 1: All challenges of mergers (by DOJ and FTC) and cases with innovation aspects

	Σ		FTC + DOJ		Σ FTC		Σ DOJ		FTC		DOJ							
	95-'08		95-'03 04-'08		95-'08		95-'08		95-'03 04-'08		95-'03 04-'08							
	total	%	total	%	total	%	total	%	total	%	total	%						
all challenged mergers*	399	100%	298	100%	101	100%	252	100%	147	100%	189	100%	63	100%	109	100%	38	100%
cases with innovation aspects** (% of all challenges)	135	34%	100	34%	35	35%	91	36%	44	30%	67	35%	24	38%	33	30%	11	29%

Sources: DOJ/FTC Annual Competition Enforcement Reports and agency complaints. The years shown are fiscal years which start on October 1st.

* including consent decrees, injunctive reliefs, administrative complaints, abandonments.

** innovation aspects in market definition and/or in anticompetitive effects.

This result supports the view that innovation concerns have been relevant in U.S. merger policy. Overall, differences between the agencies are only small with respect to the share of innovation mergers (FTC: 36%; DOJ: 30%) over the entire period. Also the comparison between 1995-2003 and 2004-2008 does not indicate significant differences between the time periods, neither in regard to all challenged mergers from both agencies nor in regard to FTC and DOJ separately. Therefore, the descriptive results do not suggest significant changes in regard to the extent of taking innovation aspects into account.

Table 2: Probit Regression: Cases with innovation effects

INNOV_CASE	Probit 2.1	Probit 2.2	Probit 2.3	Probit 2.4
FTC	-	0.101 (0.45)	-	0.096 (0.44)
D04-08	-	-	-0.089 (0.67)	-0.085 (0.67)
HITEC 1 („low“)	3.799 (0.00)	3.766 (0.00)	3.802 (0.00)	3.822 (0.00)
HITEC 2 („med-low“)	4.650 (0.00)	4.592 (0.00)	4.680 (0.00)	4.676 (0.00)
HITEC 3 („med“)	5.010 (0.00)	4.961 (0.00)	5.036 (0.00)	5.041 (0.00)
HITEC 4 („med-high“)	5.085 (0.00)	5.030 (0.00)	5.106 (0.00)	5.105 (0.00)
HITEC 5 („high“)	5.647 (0.00)	5.589 (0.00)	5.665 (0.00)	5.661 (0.00)
FTC Classes	YES	YES	YES	YES
Constant	-5.387 (0.00)	-5.362 (0.00)	-5.381 (0.00)	-5.410 (0.00)
Pseudo R ²	0.31	0.31	0.31	0.31
Log Pseudolikelihood	-141.81	-141.70	-141.71	-141.61
Obs	297	297	297	297

Note: p-values given in parentheses. All values are calculated using robust and clustered standard errors.

We now turn to the results of our regression analyses. Table 2 presents the results from different specifications (Probit 2.1.-2.4) of our probit analysis of a merger case being identified as an innovation case by the agencies. All of the models show that the assessment of innovation effects is more likely with an increasing innovation intensity measured by HITEC-dummies. Estimated coefficients of HITEC-classes are steadily increasing in each of the regressions which indicates an increasing impact of the degree of technological intenseness (“Low”, “Med-low”, “Med”, “Med-high” and “High” technology industries), in comparison to our base category HITEC 0. This result is also supported by the marginal effects calculated at the sample means which can be seen from Table A-3 in the appendix. Therefore, hypothesis H1.1, i.e. that the agencies assess more innovation aspects if the mergers take place in more innovation-intensive industries, is confirmed by the data. The results also show no significant differences between the agencies (hypothesis H 1.2), i.e., both agencies take innovation effects into account to a similar degree. Finally, there is no evidence that the probability of assessing innovation effects has changed significantly over time. As can be seen from Table 2,

our dummy D04-08 is statistically insignificant, indicating that, as suggested by our descriptive results, there is no evidence for a suspected change in regard to the consideration of innovation aspects after 2004 (hypothesis H 1.3). The Pseudo- R^2 is identical for all of the regressions. About 31% of the variation of our dependent variable can be described by our model. Hence, at least about a third of the variation in INNOV_CASES is explained by HITEC-classes as well as FTC classes.

3. Market Definition and Competitive Effects: Are the Agencies Using an Innovation-specific Approach?

3.1 Theoretical Background and Hypotheses

The traditional concept for assessing mergers uses the product market concept for identifying the relevant competitors in the market (hypothetical monopoly test) before carrying out a competitive assessment whether the merger is expected to harm consumers by raising prices or reducing innovation activities. This is the approach described in the Horizontal Merger Guidelines, both before and after their reform in 2010 (DOJ/FTC 2010). In this approach the innovation dimension is not considered in the market definition, and can only be taken into account in the competitive assessment part of the merger review. The main problem with this approach is that not all firms that are competing for innovation by investing in R&D need be active in the current product market, and that not all incumbents in the product market need be competitors in regard to innovation. Therefore, the set of relevant firms in innovation competition might be different from the relevant competitors in the current product market, leading to a wrong assessment of mergers through an erroneous market definition (for a deeper analysis, see Kern 2014).

This is the reason why the "innovation market analysis" (IMA) introduced "innovation markets" as an additional way of identifying the relevant competitors in regard to innovation. It proposed a five step procedure for assessing the innovation effects of mergers (Gilbert/Sunshine 1995, 594-597; Gilbert/Tom 2001). In a first step, it is analyzed whether R&D activities of the merging firms overlap. This step is followed by an investigation of alternative sources of innovation (step 2). This requires an analysis of the necessary resources in form of specialized assets, as, e.g., laboratory equipment or intellectual property rights. Through these two steps the innovation competitors are identified (defining the innovation market). In the

following steps 3 and 4, it is assessed whether the merged firms would have the incentives and capabilities to reduce their R&D activities through either unilateral or coordinated behaviour, or whether other competitors would render such strategies as either not feasible or not profitable. This represents the analysis of potential anticompetitive effects in regard to innovation competition, which is followed by an analysis whether an expected reduction in R&D investments through the merger could be defended through innovation-related efficiencies (step 5).

In this section, we want to analyze whether the agencies in their innovation merger cases used the above-described traditional approach or used a new, more innovation-specific concept, which might be inspired by the innovation market analysis. In fact, in our data set we identified many innovation merger cases, in which we encountered market definitions in the form of "research, development, production and sale of [...]", whereas in many others we found only "production and sale of [...]" in the market definition and innovation concerns are only mentioned in the competitive assessment of the merger. If innovation is already considered as a part of the market definition, it can be suggested that the agencies did not rely on the traditional product market approach but used a more innovation-specific approach. Thus, our decisive criterion for distinguishing both concepts is whether innovation is already considered in the market definition, or only as an additional part of the anticompetitive effects analysis after defining markets along the product market concept. We think that the other steps of the IMA approach are less crucial for defining a new innovation-specific approach, because they also can be carried out within the traditional assessment approach.

The question whether a traditional product market concept is used or a more innovation-specific approach is also relevant for the usually most important first assessment criterion, i.e. the (change of) market concentration through the merger. Although this criterion is now seen much more critically than in former times even for the assessment of static price effects, there is a broad consensus that market concentration as measured by market shares and the Herfindahl-Hirschman-Index (HHI) might not be an appropriate criterion for assessing the intensity of innovation competition, since these measures refer only to the market shares on current product markets. If firms compete for innovation, then the mere number of independent innovating firms might be a simpler but more accurate innovation-specific measure for the market concentration that is relevant for the assessment of innovation competition. This is also the way how the U.S. Antitrust IP Licensing Guidelines of 1995 take account of market concen-

tration in regard to innovation competition. There it is stated that an agreement is unlikely to have anticompetitive effects on innovation, if there are at least four other independently controlled entities competing for innovation (4 plus-rule) (DOJ/FTC 1995, § 3.2.3). Therefore, we also can distinguish two basic different groups of measures for concentration: First, conventional approaches as HHI and market shares, which refer to current product markets and are therefore aligned with the traditional assessment approach. Secondly, the agencies can also use more the pure number of competitors as a measure which is better suited for assessing innovation competition concerns.

In this section 3, we will analyze our data set in regard to the question to what extent the agencies have made their assessment more along the traditional product market approach or a newer, more innovation-specific concept focusing on the question whether they use innovation already in the market definition and the pure number of innovating firms instead of conventional concentration measures. In regard to our econometric analysis the following hypotheses will be tested. First, we have seen in section 2 that the probability that the agencies consider innovation aspects increases with the innovation intensity of the industries. Therefore, it could also be presumed that the agencies do also use a more innovation-specific approach for the assessment of innovation effects in innovation merger cases, if the merger takes place in a more innovative industry.

H 2.1: It is more likely that innovation is already considered in the market definition, whenever mergers take place in industries with high innovation intensity.

In section 2, we could not find differences between the agencies regarding the probability of assessing innovation effects of mergers. However, the question arises whether there are differences regarding the approach for the assessment of innovation effects, both for the question whether innovation is included in market definition and what kind of concentration measure is used.

H 2.2a: There are no differences between the agencies in regard to the probability that innovation is already considered in the market definition.

H 2.2b: There are no differences between the agencies in regard to the probability that the number of firms is used as a concentration measure.

What developments can we observe with respect to the applied approaches over time? In section 2, we did not find evidence for our hypothesis that the agencies have generally assessed innovation effects to a smaller extent in the period 2004-2008 in comparison with the prior period. Hence, we might also observe a similar development in regard to the use of innovation in the market definition. However, the mounting critique in the academic debate in regard to the innovation market approach suggests that the application of the new concept might have declined, leading both to a decline of the use of innovation in market definition and the use of the number of firms as concentration measure.

H 2.3a: The probability that innovation effects are considered in the market definition is lower for mergers that fall into the period 2004-2008 compared to those falling in the period 1995-2003.

H 2.3b: The probability that the number of firms is used as a concentration measure is lower for mergers that fall into the period 2004-2008 compared to those falling in the period 1995-2003.

3.2 Data and Empirical Model

The dependent variable in this model is "innovation in market definition" (INNOV_DEF), which is a dummy variable equal to one, if innovation aspects are mentioned in the market definition, otherwise it is set to zero. Regarding the different measures of concentration, we analyzed all markets with innovation aspects and determined whether the agencies provided HHIs and/or market shares, or whether they relied on the number of firms as a concentration measure. The latter concentration measure is captured by the dummy variable UNCONVENTIONAL_CONC, which is set to 1, if the agencies have mentioned the number of competitors; otherwise it is set to 0. However, it is worth noting that in some cases the agencies used both kinds of concentration measures (HHIs/market shares and the number of competitors), leading to aggregated percentages which exceed 100%. Moreover, apart from this distinction in more traditional and innovation-specific concentration measures, we also encountered statements with non-quantitative information about concentration, e.g., "highly concentrat-

ed"¹² or that the merging parties are “two of the leading suppliers in the world”¹³. Our first explanatory variable refers to the innovation intensity of the relevant markets.¹⁴ As a proxy we use the R&D expenditures (provided in U.S. Dollars spent) divided by employment (provided in percent of total employment of U.S. economy) (RDEXP/EMPL) of the industry to which the relevant market, defined in the complaint, belongs. We used the ISIC scheme on a 2-digit level and matched the corresponding relevant markets with the "STAN Indicators 2009" dataset of the OECD. In regard to the other independent variables FTC and the time period, we applied the same proxies as in the model in section 2. We used again the FTC classification as control variable for controlling industry effects. Additionally, we used the employment shares of the respective industries (EMPL) in order to control for industry heterogeneity.¹⁵ Our data set consists of all markets affected by the 135 innovation merger cases, in which the agencies have used innovation aspects in the market definition and/or the anticompetitive effects.

3.3 Results

Overall, within the set of 135 challenged mergers, the agencies considered innovation aspects in 323 relevant markets (see Table 3). The distribution of markets with innovation aspects between FTC and DOJ is similar to the one on the case level: While the FTC found 218 such markets, the DOJ investigated only 105. An important result is that in 222 markets the agencies mentioned innovation aspects in the market definition (69 % of all markets). However, while the FTC mentioned innovation in about 82% of the markets in the market definition, the DOJ refers to innovation in the market definition in only 41%. In regard to the explicit claiming of negative innovation effects in the competitive effects analysis (overall: 79%), we see the reverse picture: Here in 99% of all markets with innovation aspects, the DOJ claimed explicitly negative effects on innovation, in contrast to only 69% at the FTC. Regarding the two periods of interest, the share of markets with innovation in the market definition has overall

¹² See, e.g., The Boeing Company, File No. 001 0092, Docket No. C-3992.

¹³ See, e.g., Svedala Industri AB/Metso Oyj Corp., FTC File No. 001-0186, Docket No. C-4024.

¹⁴ In contrast to our analysis on the case level, carried out in the previous section, we were now able to use the R&D expenditures as a control variable for the innovativeness of an industry instead of the HITEC variables. Due to a significant number of transactions taking place in hardly innovative industries, we had the problem of missing data regarding the R&D expenditures on the case level.

¹⁵ Again, we used the ISIC scheme on a 2-digit level and matched the corresponding relevant markets with the "STAN Indicators 2009" dataset of the OECD.

increased from 65% (1995-2003) to 82% (2004-2008). While for FTC cases this share increased from 78% to a 95%, the DOJ mentioned innovation in market definition in about 41% of the markets in both sub-periods. When analyzing competitive effects, the DOJ mentioned innovation effects in nearly 100% in both periods, while the corresponding percentage of the FTC decreased from about 76% to 50%.

Table 3: Innovation aspects in innovation merger cases at the market level

	Σ		FTC + DOJ			Σ FTC Σ DOJ		FTC		DOJ	
	95-'08		95-'03		04-'08	95-'08		95-'03		95-'03	
	total	%	total	%	total	total	%	total	%	total	%
markets with innovation aspects	323	100%	250	100%	73	218	100%	105	100%	162	100%
innovation aspects in market definition *	222	69%	162	65%	60	179	82%	43	41%	126	78%
innovation aspects in anti-competitive effects *	255	79%	210	84%	45	151	69%	104	99%	53	95%

Sources: Agency complaints. Years shown are fiscal years.

* in % of markets with innovation aspects

Table 4 summarizes the results from the probit regressions. Surprisingly, there seems to be no statistically significant effect of the industries' innovation intensities on the probability that agencies use more innovation-specific analytical concepts (non-confirmation of hypothesis H 2.1). RDEXP/EMPL is not significant in any of the specifications. However, the descriptive results of large differences between the agencies in the extent of considering innovation already in the market definition are supported by the probit analysis. The FTC is more likely to use the innovation-specific market definition concept than the DOJ (H 2.2a). Calculating the marginal effects at the sample means (see Table A-4 in the appendix) leads, depending on the specification, to a higher probability of 15-20% that innovation is mentioned in the market definition in FTC cases.

Table 4: Probit Regression: Markets with innovation in market definition

INNOV_DEF	Probit 4.1	Probit 4.2	Probit 4.3	Probit 4.4
FTC	0.681 (0.02)	-	0.731 (0.00)	0.622 (0.01)
D04-08	-	0.543 (0.07)	0.661 (0.00)	-0.006 (0.97)
FTC*D04-08	-	-	-	1.122 (0.00)
FTC Classes	YES	YES	YES	YES
RDEXP/EMPL	6.17e-12 (0.44)	4.00e-12 (0.58)	9.82e-13 (0.88)	-3.73e-12 (0.65)
Constant	-0.684 (0.01)	-0.001 (0.07)	-0.731 (0.14)	-0.621 (0.11)
Pseudo R ²	0.35	0.34	0.36	0.37
Log Pseudolikelihood	-88.43	-90.70	-86.87	-85.91
Obs	254	254	254	254

Note: p-values given in parentheses. All values are calculated using robust and clustered standard errors.

The hypothesis that innovation in market definition has decreased from the first to the second period (H 2.3a) is not supported by the data and has to be rejected. In contrast, at least two of the specifications show evidence for a more innovation-specific approach applied in the second period (D04-08). Marginal effects show a higher probability of about 11% in 2004-2008 (see Table A-4 in the appendix). However, following specification 4.4, this increase of innovation in the market definition over time is mainly driven by the FTC. This is captured by the interaction term FTC*D04-08 which renders the main effect of period D04-08 insignificant. In contrast to the DOJ, the Federal Trade Commission seems to have used innovation aspects in the market definition more frequently in the later sub-period.

In regard to the use of concentration measures, our descriptive results of Table 5 show that the agencies used either HHIs or market shares in 50% of the markets with innovation aspects. Apart from that, the DOJ apparently relied more often on these traditional concentration measures, but the use of these measures seems to increase over time, both at the FTC and the DoJ.

Table 5: Types of applied concentration measures

	Σ		FTC + DOJ				Σ FTC		Σ DOJ		FTC				DOJ			
	95-'08		95-'03		04-'08		95-'08		95-'08		95-'03		04-'08		95-'03		04-'08	
	total	%	total	%	total	%	total	%	total	%	total	%	Total	%	total	%	total	%
markets with HHIs and/or market shares*	162	50%	118	47%	44	60%	98	45%	64	61%	67	41%	31	55%	51	58%	13	76%
markets with the number of competitors*	124	38%	87	35%	37	51%	81	37%	43	41%	52	32%	29	52%	35	40%	8	47%
markets with non-quantitative concentration measures*	81	25%	70	28%	11	15%	70	32%	11	10%	60	37%	10	18%	10	11%	1	6%

Sources: Agency complaints. Years shown are fiscal years.

* in % of markets with innovation aspects (see Table 3)

Note: The sum of all three lines exceeds 100%, because in some cases the agencies relied on more than only one kind of concentration measure.

However, in 38% of all markets, the agencies provided the number of firms for characterizing the competitive situation and also here we can observe an increase in the use of this kind of concentration measure at both agencies. The DOJ seems to use this criterion more often than the FTC. This is a surprise, because we would have expected that the FTC, which in regard to the market definition used more an innovation-specific approach than the DOJ, would also use more the number of competitors as the innovation-specific concentration measure. The overall increase of quantitative concentration measures is mirrored by a decrease of the markets with only inconcrete, non-quantitative information about concentration. Especially in the first period the FTC has challenged mergers rather often without providing quantitative concentration measures. However, in the second period these inconcrete concentration measures were mentioned only in 10% of the analyzed markets. The results of the corresponding econometric analysis can be found in Table 6 (for the marginal effects see Table A-5).

Table 6: Probit Regression: The use of the number of firms as concentration measure

UNCONVENTIONAL_CONC	Probit 6.1	Probit 6.2	Probit 6.3	Probit 6.4
FTC	-0.918 (0.02)	-	-1.059 (0.09)	-1.249 (0.05)
D04-08	-	0.843 (0.01)	1.007 (0.01)	0.020 (0.69)
FTC*D04-08	-	-	-	1.485 (0.03)
HITEC Dummies	NO	NO	NO	NO
FTC Classes	YES	YES	YES	YES
RDEXP/EMPL	-7.50e-12 (0.13)	-1.96e-11 (0.00)	-2.30e-11 (0.00)	-2.98e-11 (0.00)
Constant	0.920 (0.02)	0.007 (0.01)	1.068 (0.08)	1.260 (0.07)
Pseudo R ²	0.09	0.06	0.13	0.14
Log Pseudolikelihood	-154.98	-160.64	-148.67	-146.75
Obs	251	251	251	251

Note: p-values given in parentheses. All values are calculated using robust and clustered standard errors. The population is all markets with innovation aspects.

The surprising descriptive results regarding the lower usage of the number of firms as a concentration measure by the FTC in comparison to the DOJ is confirmed by our econometric analysis (refuting our hypothesis H. 2.2b). Regarding the use of the number of firms over time, we found evidence that the use of this concentration measure increased significantly from the first to the second period, leading to a rejection of Hypothesis H. 2.3b. However, following specification 6.4, this increase is mainly driven by the FTC. This is captured by the interaction term FTC*D04-08 which renders the main effect of period D04-08 insignificant. Therefore, with respect to the FTC, we identified a significant increase of this more innovation-specific way of concentration measuring as well as an increasing consideration of innovation effects already in the market definition (see Table 4). However, since the Pseudo-R² is rather low, the results should be interpreted with caution.¹⁶

¹⁶ It is worth noting that we also empirically tested our descriptive observations regarding the use of HHIs and market shares as traditional concentration measures and the use of non-quantitative concentration measures. However, we did not get any significant results with respect to the use of HHIs and market shares. But, we confirmed our descriptive results regarding the use of non-quantitative/inconcrete concentration measures. The observation that the FTC uses this kind of concentration measure more often and that its use decreases from the first to the second period could both be confirmed at a 1% significance level.

4. Assessment of Innovation Effects: Theories and Reasonings

4.1. Theoretical Background and Hypotheses

To what extent did the agencies also offer clear reasons how the mergers could negatively affect innovation, and what kind of theories they relied on? It is not possible here to give an overview on the broad theoretical and empirical literature that might be relevant for the assessment of innovation effects of mergers (for an overview: Gilbert 2008a). One group of arguments encompasses all reasonings that claim that mergers might reduce the innovation incentives of firms with the consequence of fewer investments in R&D or a slowing down of the innovation process.¹⁷ Although this group comprises a large number of different models and effects, we can summarize them under the heading of "innovation incentives". However, mergers might also have a negative effect on innovation, because they might reduce the number of parallel R&D projects and/or reduce the number of independent sources for future innovation in an industry. Hence, from an evolutionary economics perspective, mergers can lead to less parallel experimentation with new innovation projects, which - due to the uncertainty of the innovation process - might lead to fewer successful innovation processes. Since mergers can reduce the benefits of diverse research paths, such kind of arguments can be called diversity arguments.¹⁸ However, whereas arguments about the effects of mergers on innovation incentives are much in line with mainstream industrial economics, diversity arguments are closer aligned with evolutionary approaches to innovation economics. Although the literature on such evolutionary arguments is small, we decided to include diversity arguments in our empirical study, because in a number of cases the agencies have used very similar arguments. Particularly the settlements in pharmaceutical merger cases, in which parallel research was protected through divestitures, can be interpreted as being based upon such a diversity argument. Unfortunately, however, as it is shown in our descriptive statistics below (Table 7), the number of markets in which diversity arguments were used by the agencies (23 markets; FTC: 14; DOJ: 9) is too small for allowing an econometric analysis. Therefore, we could include them only in our descriptive statistics.

¹⁷ See Arrow (1962), Loury (1979), Lee/Wilde (1980), Dasgupta/Stiglitz (1980), Reinganum (1989), Boone (2000, 2001), Aghion et al. (2005).

¹⁸ See for evolutionary and diversity reasonings Metcalfe (1989), Nelson (1995), Farrell (2006), and Kerber (2011) with additional references.

Perhaps equally important is the question to what extent the agencies gave at all specific reasons about how a merger could lead to negative effects on innovation, or whether they merely claimed the existence of such anticompetitive effects without providing any specific arguments or evidence. Due to the general uncertainty about the consideration of innovation effects in merger cases, the specificity of reasoning regarding these effects is particularly crucial for the quality of merger reviews. Linked to this problem might be the question to what extent the agencies in addition to their innovation concerns simultaneously claimed on the same markets also static price effects. The agencies might deem it as a prudent strategy to challenge mergers in regard to innovation effects only in those cases, in which they can also claim price effects of mergers, since the latter are much more well-accepted arguments in antitrust law. Another important question is whether this uncertainty about the assessment of innovation effects in U.S. merger policy has been reduced over time due to the increasing experience during our investigation period and whether the observed differences between the agencies in the last section appear also in regard to these issues.

Based on these questions we developed the following hypotheses for our econometric analysis. Again, we presume that there are no differences between the agencies.

H. 3.1a: There are no differences between the agencies in regard to the probability that innovation incentive arguments are put forward.

H. 3.1b: There are no differences between the agencies in regard to the probability that an agency claims static price effects in addition to innovation effects.

The second group of hypotheses refers again to the development over time. Since the consideration of innovation effects was new in the 1990s, we could expect that the uncertainty regarding the assessment of these effects has decreased over time, leading to an increase of the share of challenges, in which the agencies gave specific reasons about the innovation effects of mergers. Based upon the increasing critique of the new concept of innovation markets in the antitrust discussion since the end of the 1990s, we expect that the agencies, over time, relied stronger on innovation incentive arguments, which are more compatible with the established industrial economics literature. It can furthermore be expected that the critical discussion of innovation markets also induced the agencies to back up the claimed anticompetitive innovation effects with well-accepted static price effects. This leads to the following hypotheses about the differences between the first period 95-03 and the second period 04-08:

H 3.2a: The probability that innovation incentive arguments are put forward is higher for mergers that fall into the period 2004-2008 compared to those falling in the period 1995-2003.

H 3.2b: The probability that an agency claimed also static price effects in addition to innovation effects is higher for mergers that fall into the period 2004-2008 compared to those falling in the period 1995-2003.

4.2 Data and Empirical Model

In this section the following variables have been used: The dummy variable INCENTIVE_ASP is set to 1, if the agencies have mentioned in their complaints that the merger would lead to less innovation incentives. We considered this condition as fulfilled whenever the agencies either explicitly referred to decreased innovation incentives (by using the exact wording), or by relying on reasons which can still be considered as arguments in line with the theory about innovation incentive aspects (e.g. that “[...] innovation competition among producers [...]”¹⁹ will be lessened, or that it will lead to a ‘slowdown’ in the pace of innovation²⁰). For our descriptive statistics we also investigated whether the agencies have used arguments in their complaints that can be associated with diversity aspects. We regarded an argument as driven by diversity considerations, whenever the agencies either claimed that the merger will lead to a ‘reduction or redirection’ of research and development tracks²¹, or when they highlighted the relevance of the preservation of a number of independent entities for future innovations²². However, there were also some cases in which the agencies used both kinds of arguments. If, in addition to claiming negative innovation effects, the agencies have also claimed explicitly static price effects on the same markets, then the dummy variable EXPL_STATICCON is set to 1, otherwise 0. Our independent variables FTC and the time period D04-08 are the same as in the sections 2 and 3.

¹⁹ Ciba-Geigy Ltd., 123 F.T.C. 842, at 851 (1997).

²⁰ See, e.g., *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29, 1998).

²¹ See, e.g., *The Upjohn, Co.*, 121 F.T.C. 44 (1996); *Glaxo plc*, 119 F.T.C. 815(1995); *Ciba-Geigy Ltd.*, 123 F.T.C. 842, at 851 (1997); *Hoechst AG/Rhone-Poulenc S.A.*, Docket No. C-3919 (consent order issued January 18, 2000).

²² See, e.g., *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998).

4.3 Results

Table 7: Theories and reasonings in the competitive assessment analysis

	Σ		FTC + DOJ				Σ FTC		Σ DOJ		FTC				DOJ			
	95-'08		95-'03		04-'08		95-'08		95-'08		95-'03		04-'08		95-'03		04-'08	
	total	%	total	%	Total	%	total	%	total	%	total	%	total	%	total	%	total	%
markets with innovation incentive arguments*	105	33%	73	29%	32	44%	67	31%	38	36%	45	28%	22	39%	28	32%	10	59%
markets with diversity arguments*	23	7%	21	8%	2	3%	14	6%	9	9%	13	8%	1	2%	8	9%	1	6%
inconcrete reasonings*	210	65%	171	68%	39	53%	148	68%	62	59%	115	71%	33	59%	56	64%	6	35%
markets with static price concerns*	272	84%	204	82%	68	93%	168	77%	104	99%	117	72%	51	91%	87	99%	17	100%

Sources: Agency complaints. Years shown are fiscal years.

Note: The sum of the first three lines exceeds 100%, because in some cases the agencies mentioned both diversity and innovation incentive arguments.

* in % of the markets with innovation aspects (see Table 3)

The results of our descriptive statistics can be found in Table 7. Out of 323 relevant markets, on which negative effects on innovation have been claimed, the agencies have mentioned innovation incentive arguments for 105 markets (32.5%). FTC and DOJ mentioned diversity-related arguments for only 23 markets (7%). Since for the period D04-08 our sample contains only 2 markets (FTC: 1 and DOJ: 1), this might be a sign for a decline of the use of diversity arguments (but we cannot test this econometrically due to too few observations). A very important result is that in 65% of the relevant markets the agencies have not given any specific reasoning how the mergers might lead to negative effects on innovation. This encompasses both cases, in which innovation was used in the market definition and only a general claim of anticompetitive effects has been made, as well as cases, in which negative effects on innovation were claimed in the anticompetitive effects but without giving any specific arguments (as, e.g., innovation incentives).

Comparing the agencies, the DOJ has given more specific reasonings than the FTC, although even the share of the DOJ is still rather low (DOJ: 41%; FTC: 32%). Over time an increase of explicit reasonings can be observed (95-03: 32%; 04-08: 47%). But even in the latter period the share of markets without clear specific arguments is still over 50%. In contrast to this, it is noteworthy that in over 80% of markets with innovation concerns (84%) the agencies have

also claimed explicitly static price effects. A closer look reveals that particularly the DOJ has nearly always (99%) also claimed static price effects (while the FTC did so in 77% of the markets with innovation aspects). Moreover, the overall percentage of markets with claims about static price effects has increased from the first to the second period (95-03: 82%; 04-08: 93%).

Table 8: Probit Regression: Markets with innovation incentive arguments

INCENTIVE_ASP	Probit 8.1	Probit 8.2	Probit 8.3	Probit 8.4
FTC	-0.341 (0.42)	-	-0.423 (0.35)	-0.326 (0.54)
D04-08	-	0.715 (0.06)	0.790 (0.05)	1.479 (0.00)
FTC*D04-08	-	-	-	-0.914 (0.34)
FTC Classes	YES	YES	YES	YES
RDEXP/EMPL	4.79e-12 (0.79)	-5.40e-12 (0.76)	-6.34e-12 (0.71)	-2.82e-12 (0.47)
Constant	0.207 (0.43)	0.2342 (0.47)	0.449 (0.15)	0.309 (0.86)
Pseudo R ²	0.07	0.09	0.10	0.10
Log Pseudolikelihood	-144.66	-142.52	-140.67	-139.97
Obs	252	252	252	252

Note: p-values given in parentheses. All values are calculated using robust and clustered standard errors.

Although the descriptive statistics might suggest that the DOJ uses a bit more often innovation incentive arguments than the FTC, the regression results (see Table 8; marginal effects in Table A-6) confirm our hypothesis H. 3.1a claiming that there are no differences in regard to the use of innovation incentive arguments between both agencies. Possible differences are not statistically significant when controlling for other impacts. We also found a statistically significant positive impact of the time period D04-08 on the use of innovation incentives arguments (confirming the hypothesis H. 3.2a). Again RDEXP/EMPL is not statistically significant at any usual level.²³

²³ Note that we also empirically tested for markets with inconcrete reasonings. However, in these regressions we did not obtain any significant results. Hence, although the descriptive observations have suggested that the DOJ made less unspecific arguments than the FTC and that the share of inconcrete claims of negative innovation effects is furthermore slightly falling in the second period, we did not find econometric evidence for these descriptive results.

Table 9: Probit Regression: Markets with static price effects arguments

EXPL_STATICCON	Probit 9.1	Probit 9.2	Probit 9.3
FTC	-2.515 (0.00)	-	-2.588 (0.00)
D04-08	-	-0.018 (0.91)	0.595 (0.00)
FTC Classes	YES	YES	YES
RDEXP/EMPL	7.96e-11 (0.01)	5.36e-11 (0.00)	6.69e-11 (0.00)
Constant	0.586 (0.00)	-1.173 (0.00)	1.023 (0.00)
Pseudo R ²	0.37	0.21	0.38
Log Likelihood	-64.30	-80.52	-63.51
Obs	171	171	171

Note: p-values given in parentheses. All values are calculated using robust and clustered standard errors.

Quite interesting results emerged from our analysis of the hypotheses about static price effects (see Table 9). The FTC claimed significantly less often static price effects than the DOJ in markets where they also claimed innovation concerns (rejection of hypothesis H. 3.1b). Given the marginal effects at the sample means reveals that the probability that the FTC claims also static price effects is about 20% lower compared to the DOJ (for the marginal effects see Table A-7). The results about changes over time have to be interpreted with some caution. D04-08 is only statistically significant in model 9.3. Following this result, static price effects were claimed more in the later period 2004-2008 than in the former one (1995-2003), which would confirm our hypothesis H. 3.2b. Marginal effects suggest a higher probability by about 9% in the period 2004-2008.²⁴ It is a surprising result that the innovation intensity of industries contributes significantly to the explanation of the use of static price effects but not to the use of innovation incentives.

5. Discussion and Conclusions

In our empirical study we analysed to what extent and how the U.S. antitrust agencies assessed potential negative innovation effects of mergers in the period from the emergence of the "innovation market analysis" in 1995 (as the first innovation-specific assessment ap-

²⁴ Note that we also tested for a possible interaction between the FTC and the D04-08 variables. However, the interaction term FTC*D04-08 was omitted due to collinearity.

proach) until 2008. The background is the still unresolved question how innovation effects of mergers should be assessed, and whether the traditional "product market approach" (or other approaches as the "potential competition" or the "future market" concept) are sufficient or the application of a more innovation-specific approach, as, e.g., the "innovation market analysis", is necessary. In this paper we did not intend to discuss this question (for a detailed discussion see Kern 2014), but wanted to analyze empirically the merger case practice of the DOJ and FTC in regard to innovation effects of mergers.

Our empirical study shows that the agencies claimed anticompetitive innovation effects in one third of all challenged mergers as a reason for intervention. The econometric results show neither significant differences between the first and second time period (1995-2003, 2004-2008) nor between the two agencies. Therefore, both the politically more directly dependent Antitrust Division of the DOJ and the more independent (and bipartisan) FTC have taken negative innovation effects of mergers into account to a similar extent. Overall, this supports the view that innovation was taken seriously (at least to a certain degree) in U.S. merger policy - despite the increasingly critical attitude to the "innovation market analysis" in the U.S. antitrust discussion. However, our study cannot contribute to the question in how many cases the agencies have erroneously not claimed negative innovation effects ("false negatives") or wrongly claimed innovation concerns ("false positive"). Such an ex-post case analysis of the assessment of innovation effects is still missing. However, the empirical result that the probability for innovation concerns being raised increases significantly with the innovation intensity of the respective industry supports the claim that innovation effects were taken stronger into account in more innovative industries. This indicates that, overall, the agencies might not have made too many mistakes.²⁵

Although both agencies claimed innovation concerns to a similar extent, our study found considerable differences between the FTC and the DOJ regarding the basic assessment approach. We could identify in our data set two different approaches which were applied to a different degree by the two agencies. Whereas the DOJ more often used a traditional approach, which defines markets according to the product market concept and considers innovation effects only in the competitive assessment, we also found a more innovation-specific approach (mostly at the FTC), which already considers research and development in the market definition and then asks about the competitive effects on these markets. Although we would not

²⁵ See also the empirical study of Park/Sonenshine (2012) from a slightly different perspective.

claim that this second approach is a direct application of the innovation market analysis, we view the rejection of a pure product market concept and the explicit inclusion of innovation in the market definition as a clear sign for an innovation-specific approach, which differs significantly from the traditional one. Since, overall, in nearly 70% of all markets with innovation concerns innovation was already used in market definition, the pure product market approach was applied less often than the more innovation-specific one. Even the DOJ used it in 41% of all markets with innovation concerns. Since our econometric results show that its overall use even increased during the investigation period, this innovation-specific approach seems to have gotten more support in the practice of the agencies over time.

At first sight, it seems to be a surprising result that we could not confirm our hypothesis that the innovation-specific approach was used more in regard to mergers in innovation-intensive industries, although innovation effects are more taken into account in those industries. This result can only be interpreted in that way that the agencies have different opinions about which approach is better suitable for assessing innovation effects generally but do not think that one is better suited for less innovative industries and the other more for more innovative industries. This picture of two different concepts gets a bit more blurred, if we take into account our results about the use of the number of innovating firms as a more innovation-specific measure for concentration compared to market shares and the HHI as concentration measures that are directly linked to the product market concept. Although we have a significant increase of the use of the number of firms from the first to the second sub-period, which would fit nicely to the general increasing use of an innovation-specific assessment approach, we found that it is the DOJ, which used the number of firms as concentration measure more often than the FTC, even though the DOJ relied stronger on the traditional product market approach.

A striking and worrisome result in regard to the reasonings of the agencies is that in the majority of markets, in which they claimed innovation concerns, they gave no specific reasons why the mergers might lead to negative innovation effects. We could also show econometrically that this does not improve from the first to the second time period. In those cases where they provided reasonings, innovation incentive arguments were most important (in a third of all markets with innovation concerns). This kind of reasoning is based upon well-established approaches in industrial economics, and also the innovation market analysis used these reasonings. In our empirical study we found that there are no significant differences between the

FTC and DOJ regarding their use, and the agencies also relied stronger on innovation incentive arguments during the second time period. The increasing use of innovation incentive arguments and the near disappearance of diversity arguments in the second period might be interpreted as the result of a greater cautiousness of the agencies through relying on a more well-established kind of theoretical reasoning.

Such a strategy of greater cautiousness might also be the explanation for another surprising and puzzling result, namely the very large and increasing share of markets, in which the agencies claimed simultaneously innovation concerns and static price effects. Theoretically, anti-competitive effects of a merger on innovation on the one hand and prices on the other hand are very different effects. Price effects of mergers can emerge in established product markets either as a consequence of unilateral effects (due to less competitive pressure) or of coordinated effects through a higher likelihood of successful price collusion - requiring in both cases to take a deeper analysis (e.g., a merger simulation or investigating the specific conditions for successful price collusion). This is, however, very different from any specific analysis regarding the impact of mergers on innovation incentives, particularly, if we take into account that the relevant competitors regarding innovation competition do not necessarily correspond to those of price competition on established product markets. However, our study shows that in 272 of 323 markets with innovation concerns, the agencies claimed both anticompetitive innovation and price effects of mergers. Here we also found significant differences between the agencies: The FTC found significantly less often static price effects in markets with innovation concerns than the DOJ. In fact, the DOJ nearly always claimed also price effects, whenever they claimed innovation concerns. In addition to that, the probability of claiming also price effects seems to have increased significantly from the first to the second period. This also implies that the share of markets, in which primarily negative innovation effects (without explicitly referring to price effects) have been claimed, has decreased considerably - at the FTC from 28% to 9%, whereas none could be found in the second period at the DOJ. Our interpretation of these results is that also due to the critique of the innovation market analysis, the agencies were getting increasingly cautious in challenging a merger without simultaneously claiming also static price effects. If such an interpretation is correct, then the DOJ had used such a strategy from the beginning, whereas the FTC increasingly embarked on such a cautious strategy during the investigation period.

Overall, the results of our study show clearly that the U.S. agencies have taken the analysis of innovation effects of mergers seriously. This is also supported by the fact that in a considerable number of cases settlements were made, in which the remedies explicitly focused on maintaining innovation competition, esp. in regard to mergers in the pharmaceutical industry (Carrier 2008, Kern/Kerber 2014). Here divestitures in regard to R&D projects played an important role with the explicit objective, to impede the reduction of the number of parallel research projects. However, we could not see a clear tendency towards a clarification of the assessment approach for innovation effects. Not only the still very large share of claims about innovation concerns without specific reasonings, but also the differences between the agencies about the applied approaches and the general tendency of greater cautiousness by relying more on traditional, well-established reasonings and the backing up of innovation concerns by simultaneously claiming static price effects are signs for the uncertainty of the agencies how to deal with innovation effects of mergers. This uncertainty also emerged in the U.S. antitrust discussion about the reform of the U.S. Horizontal Merger Guidelines (DOJ/FTC 2010). An analysis of this discussion shows that despite a broad consensus about the importance of assessing innovation effects, there is still a large uncertainty and a great reluctance in recommending innovation-specific assessment approaches (Kerber/Kern 2014 with more references). Despite this discussion, it is surprising how clearly the new U.S. Horizontal Merger Guidelines still stick to the old product market approach, with the consideration of innovation only in the competitive assessment part, because this contradicts to a large extent the practice of the agencies during our investigation period - with its wide-spread consideration of innovation already in the market definition, and the still existing U.S. Antitrust IP Licensing Guidelines of 1995 (with its explicit use of innovation markets) (Feng 2012).

There are a lot of questions for future research. An obvious question is whether the merger policies of the U.S. agencies in this regard have changed since 2008, e.g., due to a change of antitrust policy by the Obama Administration, or, whether due to the clear decision for the product market concept in the new Horizontal Merger Guidelines in 2010 the agencies changed their assessment approaches. In the same way, a parallel and comparative empirical study about the practice of the European merger policy would be very interesting, especially since they never officially used the innovation market concept but also assessed innovation effects of mergers (and sometimes in the same merger cases). However, most important is further research in regard to the still open question how an appropriate investigation frame-

work for assessing innovation effects of mergers should look like (in more detail Kerber/Kern 2014).

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APPENDIX

Table A - 1: The Sectoral Taxonomies

Nace	Industry	CrType	AcType	ApType	CuType	InnoType
10	Mining: coal, peat	TAD	ACQU	None	Low	Med-low
11	Mining: petroleum, gas	TAD	ACQU	None	Med	Med-low
14	Mining: other	Other	None	None	Low	Low
15	Food products, beverages	TAD	ACQU	FORM	Low	Med-low
16	Tobacco products	TAD	IR&D	FORM	Low	Med-low
17	Textiles	MCRE	IR&D	FORM	Med	Med-high
18	Wearing apparel, fur	Other	None	FORM	Low	Low
19	Leather, -products, footwear	Other	None	FORM	Low	Low
20	Wood, -products, cork	Other	ACQU	None	Low	Med
21	Pulp/paper, -products	MCRE	ACQU	FORM	Med	Med
22	Publishing, reproduction	TAD	ACQU	FORM	Low	Med-low
23	Ref. petroleum, nucl. fuel	MCRE	IR&D	PAT+	Med	Med-high
24	Chemicals	MCRE	IR&D	PAT+	High	Med-high
25	Rubber and plastics	MCRE	IR&D	PAT+	Med	Med-high
26	Mineral products	MCRE	IR&D	BAL	Med	Med-high
27	Basic metals	MCRE	IR&D	PAT+	High	Med-high
28	Fabricated metal products	MCRE	ACQU	None	Low	Med
29	Machinery, nec.	HCRE	HR&D	PAT+	High	High
30	Computers, office machinery	HCRE	HR&D	BAL	Med	High
31	Electrical equipment, nec.	HCRE	IR&D	PAT+	High	High
32	Communication technology	HCRE	HR&D	BAL	High	High
33	Precision instruments	HCRE	HR&D	PAT+	High	High
34	Motor vehicles, -parts	MCRE	IR&D	PAT+	High	Med-high
35	Other transport equipment	MCRE	IR&D	PAT+	Med	Med-high
36	Manufacturing nec.	MCRE	ACQU	BAL	Med	Med
37	Recycling	Other	None	None	Low	Low
40	Electricity and gas	TAD	ACQU	None	Low	Med-low
41	Water supply	TAD	None	None	Low	Med-low
51	Wholesale trade	Other	None	None	Low	Low
60	Land transport, pipelines	Other	None	None	Low	Low
61	Water transport	Other	None	None	Low	Low
62	Air transport	Other	ACQU	None	Low	Med
63	Auxiliary transport services	Other	None	None	Low	Low
64	Post, telecommunications	HCRE	ACQU	FORM	Med	Med-high
65	Financial intermediation	MCRE	ACQU	STRAT	High	Med
66	Insurance, pension funding	TAD	ACQU	STRAT	High	Med-low
67	Auxiliary financial services	Other	None	FORM	Low	Low
72	Computer services	HCRE	HR&D	STRAT	High	High
73	Research and development	HCRE	HR&D	PAT+	High	High
74	Other business services	MCRE	ACQU	STRAT	High	Med

Note: CrType—*HCRE*: highly creative firms with product (and process) innovations; *MCRE*: intermediate creative firms only with process innovations; *TAD*: adaptive firms with technology adoption; *Other*: adaptive firms pursuing opportunities other than from technological innovation. OpType—*HR&D*: high intramural R&D (>5% of firm turnover); *IR&D*: intramural R&D; *ACQU*: acquisition of new knowledge (R&D, machinery, patents, etc.); *None*: no innovation activities. ApType—*PAT+*: high use of patents and other measures; *BAL*: balanced use of various measures; *FORM*: other formal measures; *STRAT*: strategic means; *None*: no measures for appropriation. CuType—*High*: high cumulateness; *Med*: intermediate cumulateness; *Low*: low cumulateness of knowledge.

Source: Peneder (2010: 331)

Table A - 2: Variables description

Variables	Description
INNOV_CASE	Cases with innovation aspects
INNOV_DEF	Markets with innovation in market definition
INCENTIVE_ASP	Markets with innovation incentive aspects
DIV_ASPECTS	Markets with diversity aspects
EXPL_STATICCON	Explicit static effects in addition to innovation
UNCONVENTIONAL_CONC	No. of competitors as concentration measure
FTC	Accounts for the FTC/DoJ
D95-03	Time period 1 (FY 1995 - FY 2003)
D04-08	Time period 2 (FY 2004 – FY 2008)
HITEC 0	Industry was not a part of Peneder's taxonomy
HITEC 1 („low“)	“Low” technology industries
HITEC 2 („med-low“)	“Med-low” technology industries
HITEC 3 („med“)	“Med” technology industries
HITEC 4 („med-high“)	“Med-high” technology industries
HITEC 5 („high“)	“High” technology industries
FTC CLASS 1	Retail
FTC CLASS 2	Professional Services
FTC CLASS 3	Food & Beverages
FTC CLASS 4	Energy
FTC CLASS 5	Hospitals/Clinics and Pharmacies
FTC CLASS 6	Consumer Goods
FTC CLASS 7	Cable TV
FTC CLASS 8	Chemicals/Industrial Gases
FTC CLASS 9	Defense
FTC CLASS 10	Industrial Goods
FTC CLASS 11	Information and Technology - Hardware
FTC CLASS 12	Information and Technology – Other
FTC CLASS 13	Medical Equipment/Devices
FTC CLASS 14	Prescription Drugs
FTC CLASS 15	Software/Databases
FTC CLASS 16	Professional Services – Other
RDEXP	R&D expenditures of the relevant industry
EMPL	Employment shares of the relevant industry

Source: Authors

Table A-3: Marginal Effects of Table 2

	Probit 2.1	Probit 2.2	Probit 2.3	Probit 2.4
FTC	-	0.0306	-	0.2894
D04-08	-	-	-0.0265	-0.0252
HITEC 1	0.8152	0.8137	0.8155	0.8169
HITEC 2	0.8800	0.8782	0.8808	0.8815
HITEC 3	0.8802	0.8787	0.8809	0.8816
HITEC 4	0.9864	0.9853	0.9868	0.9867
HITEC 5	0.9805	0.9797	0.9808	0.9809

Table A-4: Marginal Effects of Table 4

	Probit 4.1	Probit 4.2	Probit 4.3	Probit 4.4
FTC	0.1847	-	0.1920	0.1541
D04-08	-	0.1051	0.1150	-0.012
FTC*D04-08	-	-	-	0.1614

Table A-5: Marginal Effects of Table 6

	Probit 6.1	Probit 6.2	Probit 6.3	Probit 6.4
FTC	-0.3538	-	-0.4037	-0.4676
D04-08	-	0.3264	0.4082	n.s.
FTC*D04-08	-	-	-	0.5323

n.s.: not statistically significant

Table A-6: Marginal Effects of Table 8

	Probit 8.1	Probit 8.2	Probit 8.3	Probit 8.4
FTC	n.s.	-	n.s.	n.s.
D04-08	-	0.2663	0.2940	0.5384
FTC*D04-08	-	-	-	n.s.

n.s.: not statistically significant

Table A-7: Marginal Effects of Table 9

	Probit 9.1	Probit 9.2	Probit 9.3
FTC	-0.2048	-	-0.2184
D04-08	-	n.s.	0.0898
FTC*D04-08	-	-	-

n.s.: not statistically significant

Essay V:

Assessing Innovation Effects in US Merger Policy: Theory, Practice, Recent Discussions, and Perspectives

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Status:

MIMEO

In einer früheren Version vorgestellt auf:

EALE 2010 (European Association of Law and Economics), Paris
13th Conference of the International Schumpeter Society 2010, Aalborg
35. Hohenheimer Oberseminar 2010, Ilmenau

Assessing Innovation Effects in US Merger Policy: Theory, Practice, Recent Discussions, and Perspectives

Wolfgang Kerber and Benjamin R. Kern*

Abstract: Despite a broad consensus about the importance of also considering innovation effects of mergers (in addition to the usual price effects), it is still very unclear to what extent and how innovation effects of mergers should be assessed. In this paper, the results of the first comprehensive (quantitative) empirical study on how the US antitrust authorities DoJ and FTC assessed mergers in regard to their innovation effects from 1995 to 2008 are presented. We could find 135 challenged mergers with overall 323 relevant markets, in which the authorities had also innovation concerns. Whereas in Kern/Dewenter/Kerber (2014) we have focused much more narrowly on the econometric results, this paper (in section 3) presents all our results (in a non-technical way) and analyzes them in the broad context of the theoretical discussion about innovation effects of mergers (section 2) and the recent discussion on how to deal with innovation effects in regard to the reform of the U.S. Horizontal Merger Guidelines (chapter 4). In our empirical study, we are mainly interested in the question to what extent the agencies have assessed innovation effects within the traditional product market concept or by using a more innovation-specific approach which would consider research and development already in the market definition (along basic ideas of the innovation market analysis). Important results of our study are: In more than a third of all challenged mergers also innovation concerns were raised - with no differences between the agencies and over time. However, the agencies used rather different assessment approaches, the DoJ more the traditional product market concept and the FTC more an innovation-specific approach; however, overall an innovation-specific approach was used more often. We also analyzed the cases for the applied concentration measures and levels, barriers to entry, the reasonings of the agencies, simultaneity of static price effects claims, and remedies. Our overall results are very ambivalent: The agencies have assessed innovation effects and this often also in an innovation-specific way, but they did not succeed to develop a clear and consistent approach and seemed to have gotten more cautious over time. In chapter 4, these results are confronted with the recent US antitrust discussion about the reform of the U.S. Horizontal Merger Guidelines. Both this discussion as well as the new Guidelines shows a clear reluctance of adopting a more innovation-specific approach (by sticking clearly to the product market approach) which is at odds with the practice of the agencies until 2008. This disappointing result leads the authors to develop some ideas for new research perspectives on this issue.

JEL classification: K12, L12, L41, O31

Keywords: innovation, merger policy, US antitrust, innovation markets, Horizontal Merger Guidelines

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1. Introduction

In recent years the question whether and how innovation should be taken into account in competition law has become relevant in a number of different case groups within competition and antitrust law. Several of these case groups are directly connected to the complex relationship between competition and IP law, as, e.g., refusal to license cases, standard-essential patent cases, patent pools and cross-licensing in licensing agreements as well as the patent settlement cases in the pharmaceutical industry. But innovation concerns also seem to play a large role in many other competition law cases in the U.S. and the EU, esp. in high technology industries and the internet economy, as, e.g., in the recent Google search engine case, or in merger cases as Intel/McAfee. In the community of antitrust scholars on both sides of the Atlantic there is both a consensus about the great relevance of innovation effects in competition law and, at the same time, a lot of uncertainty and concern whether active attempts of competition authorities to protect innovation competition might not do more harm to innovation than support innovation, esp. in dynamic industries. Part of the problem is the question, whether we know enough about innovation processes for being capable of protecting innovation competition through competition law. However, the uncertainty might also be a sign of much deeper conceptual problems in regard to the relation between competition and innovation or between the static and dynamic dimensions of competition. This raises the question whether traditional categories in competition law (based upon static concepts) might be sufficiently suitable for dealing with innovation aspects.¹

Such conceptual issues also have been raised in regard to the question to what extent and how innovation effects should be taken into account in merger reviews. Both in the EU and the U.S. there is a consensus that for the assessment of mergers due to their effects on consumers both price effects and innovation effects are important. However, since the 1990s competition authorities have focussed mainly on the question whether a merger would raise prices in the short term (using the manifold new sophisticated methods of economics). Therefore, the danger has emerged that longer-term anticompetitive effects of mergers on innovation are going to be neglected. The current Horizontal Merger Guidelines of the EU and (despite some changes 2010) also of the U.S. antitrust policy reflect this main focus on short-term price effects very clearly (EU Commission 2004, DOJ/FTC 2010). The reasons of this reluctance to consider innovation effects in merger reviews lie to a large extent in the uncertainty about how competition authorities should assess the impact of a merger on innovation (both in regard to pro- and anticompetitive effects). This reflects on one hand general concerns about our capabilities for assessing innovation effects of mergers. On the other hand, however, it also raises the question whether we might need new, more innovation-specific approaches for assessing the effects of mergers beyond the traditional approach based upon the product market concept which is still dominating the Horizontal Merger Guidelines in the EU and the U.S.

In regard to merger reviews, the only new explicitly innovation-specific assessment approach was the "Innovation Market Analysis" (IMA), developed and introduced into the U.S. antitrust discussion in the mid 1990s (Gilbert/Sunshine 1995). The basic idea of the innovation market analysis was to identify

¹ From an economic perspective see, e.g., Pleatsikas/Teece (2001), Sidak/Teece (2009), Shapiro (2012); from the law perspective, see, e.g., Drexel (2012).

the relevant competitors in regard to innovation competition independently from product markets by asking for (overlapping) innovation activities and necessary specialized assets, and then analyzing whether these innovation competitors have the capabilities and incentives for reducing or slowing down innovation activities (taking also into account any innovation efficiencies). The main difference to the traditional approach is that innovation is seen as already relevant for the definition of markets, and not only as part of the competitive assessment analysis. Whereas the "innovation markets" have been (and still are) included into the Antitrust Guidelines for the Licensing of Intellectual Property (DOJ/FTC 1995) in addition to product markets, this approach neither was used in the new U.S. Horizontal Merger Guidelines (DOJ/FTC 2010) nor adopted by EU competition policy. It is well known that the "Innovation Market Analysis" was harshly criticized in the literature, claiming huge doubts about its feasibility and necessity. However, despite this critique, already a superficial analysis of the merger cases of both U.S. antitrust authorities DOJ and FTC shows that in a large number of cases innovation not only seemed to have played a role in merger assessments, but that the agencies also used to some extent innovation-specific approaches for assessing the effects of mergers. This also included the use of innovation in the market definition, and the explicit protection of innovation competition through innovation-specific structural remedies in settlements (Katz/Shelanski 2007a, Carrier 2008).

The main objective of this paper is an analysis of the practice of the U.S. antitrust authorities in regard to the assessment of negative innovation effects of mergers. To a large extent, this analysis is based upon the results of an own empirical study how the DOJ and the FTC have assessed mergers in regard to innovation effects. We analyzed the "complaints" and "decision and orders" from all 399 mergers challenged by the DOJ or FTC between 1995 and 2008, and could identify 135 mergers, in which the agencies mentioned innovation concerns in overall 323 relevant markets. One important question in that regard was whether the U.S. authorities use predominantly a traditional assessment approach based upon the product market concept or whether they have also used or at least experimented with more innovation-specific assessment approaches, e.g. inspired by the "Innovation Market Analysis". The econometric part of this empirical study (with all the technical details) can be found in Kern/Dewenter/Kerber (2014). In this longer article here we present all the results we have found and discuss them within a much broader context, in regard to (1) the existing theoretical and empirical knowledge about innovation effects of mergers, (2) the discussion about suitable approaches for assessing innovation effects, and (3) the overall U.S. antitrust policy discussion about this issue, e.g., in the discussion about the revision of the Horizontal Merger Guidelines.

How is this paper structured and what are important results of our analysis? In the next section 2, we firstly present a brief overview about the large body of theoretical and empirical literature in economics about innovation effects of mergers, showing the complexity of the problem but also that mergers can raise innovation concerns (particularly from an empirical perspective). At least as important is, secondly, the critical discussion of different approaches how to assess innovation effects in a structured way, e.g., the concepts of "potential competition", "future markets", or "innovation markets", but also discussing the question of presumptions and the relevance of case-specific analysis. These insights from section 2 provide the theoretical framework for the presentation and analysis of the results of our empirical study in section 3.

Overall, our results about the practice of the assessment of innovation effects of mergers by the two U.S. antitrust authorities are very mixed and ambivalent. On one hand, we can show that in this entire period of 1995 until 2008, both agencies did consider innovation effects (in a third of all cases). On the other hand, the study also reveals that the two agencies did not have a clear and consistent assessment approach, and that both of them differed significantly also in regard to the question whether a more traditional product market approach should be used (mainly the DOJ) or whether a more innovation-specific approach should be applied, in which innovation is already considered in the market definition (used more by the FTC). A problematic outcome of our investigation is that in most cases the agencies gave no specific reasoning why the merger should lead to negative effects on innovation. Only in a minority of cases innovation incentive arguments and in some cases diversity arguments were mentioned. Another surprising and puzzling result is that the agencies increasingly have claimed simultaneously negative innovation and static price effects. We tend to interpret this as a sign of cautiousness and uncertainty of the agencies by backing up their innovation concerns with more traditional and well-established claims about price effects. However, we also found a rather consistent practice of using structural remedies for protecting competition between R&D projects, esp. in the pharmaceutical industry. A final conclusion of our study will be that, on one hand, assessing innovation effects is a well-established practice in U.S. merger policy, but, on the other hand, there are a lot of inconsistencies and open conceptual questions in regard to the assessment approach, which also have not diminished over time.

This mixed and ambivalent assessment of the practice up to 2008 will be the starting-point for our final analysis in section 4. A brief (qualitative) analysis of important merger cases after 2008 as well as an analysis of the reform discussion leading up to the revision of the Horizontal Merger Guidelines in 2010 will show, firstly, that the cautious approach to assessing innovation effects has not changed under the Obama Administration, and, secondly, that despite the general consensus about the importance of innovation effects, the U.S. discussion is still very critical to more innovation-specific approaches in merger reviews. This can be seen in the revised U.S. Horizontal Merger Guidelines, which stick entirely to the traditional product market approach. As far as some statements about the assessment of innovation effects are included in the Guidelines as part of the unilateral effects analysis, we will come to the conclusion that they are vague and inconsistent and do not give clear guidance about the assessment of mergers in regard to innovation competition. In that respect, the guidelines also do not seem to reflect the already well-established practice of the U.S. antitrust agencies of using innovation-specific assessment approaches to a considerable extent. This rather negative assessment of the recent developments and discussions in combination with the emergence of innovation issues in other competition law contexts has motivated us to ponder briefly in our last subsection about new avenues of research in regard to the assessment of innovation effects of mergers, which might also be relevant for the general discussion how innovation should be taken into account in competition and antitrust law.

2. Theoretical Framework and Assessment Concepts

2.1 Introduction

Both the EU and the U.S. merger policy have the main objective to prevent negative effects on consumers through substantially lessening of competition (EU: significant impediment to effective competition) caused by mergers. From an economic perspective mergers can harm consumers in different ways: Substantially lessening of competition can lead to higher prices, less quality and choice, or also less innovation. Although this multi-dimensionality of potential negative effects of mergers is acknowledged by EU competition and U.S. antitrust law, the Horizontal Merger Guidelines (in the U.S. and the EU) focus nearly exclusively (as many competition economists) on the question whether a merger would lead to higher prices, through coordinated or uncoordinated (price-increasing) effects balanced with (potentially price-decreasing) efficiency effects. However, from an economic perspective, it is clear that all effects on consumers through less competition should be taken into account. There is a wide-spread consensus among competition economists and lawyers that effects on innovation are the most important of these non-price effects. As in the case of price effects, a merger can lead both to positive and negative effects on innovation, implying a possible trade-off within the innovation dimension. But if a merger can have several different effects on consumer welfare, then many more trade-offs might emerge. Particularly well-known is the trade-off between higher prices on one hand and the (long-term) benefits of more innovation on the other hand (leading to the static vs. dynamic efficiency trade off), but there also might be a trade-off between (short-term) efficiency effects of mergers and long-term negative innovation effects through higher concentration.² In the following, we will focus primarily on the problem of the assessment of negative innovation effects of mergers.

For answering the question how competition authorities should assess mergers and what kind of criteria they should use, two different levels of analysis have to be carefully distinguished: The first level refers to the question what we know about the effects of mergers on prices, innovation, and other non-price effects that are relevant for the consumers in these markets. In the following section 2.2, we will give an overview about the most important results of research in economics about possible anticompetitive effects of mergers on innovation. This is based mostly on theoretical and empirical research in innovation and industrial economics, and is primarily a discussion among economists. A second level of analysis refers to the question, what kind of theoretical assessment framework (and which criteria) should be used for analyzing a specific merger in regard to its effects on innovation. Such an assessment framework encompasses the step-by-step proceedings of a merger review: Defining relevant markets first, and afterwards carrying out a competitive assessment by using a set of relevant criteria and investigation methods, is usually a crucial part of such an assessment framework. The practices in former cases as well as guidelines, e.g., about defining markets or assessing horizontal mergers, provide information about the assessment framework competition authorities are using for deciding whether and how they are assessing the effects of mergers. Part of this framework are also such instruments as safe harbour rules, presumptions, and rules about burden of proof as well as rules about

² For a comprehensive analysis of different trade offs in regard to mergers and innovation, see, e.g., Katz/Shelanski (2007a); for the important analysis of innovation efficiencies, see, e.g., AMC (2007).

possible remedies. From a legal as well as from an economic policy perspective, the ultimate research question refers to the problem what the most suitable assessment framework is for innovation effects of mergers. For this discussion, the knowledge from the first level of analysis about the innovation effects of mergers is a necessary and valuable input, but it also requires an additional analysis that is usually not done by innovation or industrial economists. This is the level, at which the question has to be discussed whether the traditional product market approach is also suitable for taking into account innovation effects or whether a more innovation-specific assessment framework might be necessary. This second level of the analysis will be addressed in section 2.3.

2.2 Innovation Effects of Mergers: Theoretical and Empirical Results

2.2.1 Introduction

Both legal scholars and economists agree on the huge importance of competition for new products and technologies, and that market competition is a crucial driver for innovation. However, until today the concept of innovation competition has not been clarified very well. Neoclassical mainstream economics, based upon maximizing agents and the (game-theoretic) equilibrium concept, always had serious difficulties in integrating technological progress into its paradigm. Important here is Hayek's critique that the model of perfect competition already assumed that the firms know the best products and production functions, and therefore does not address the true function of market competition, namely that competition is a "discovery procedure", in which the firms search for better problem solutions in a process of trial and error (Hayek 1978). This echoes Schumpeter's insistence that competition is foremost a process of innovation and imitation, and that this dimension of (Schumpeterian) competition is much more important than traditional price competition (Schumpeter 1942). As we will see, industrial economists have developed a large number of models about important aspects of innovation, especially in regard to innovation incentives. However, the specific characteristics of innovation processes (complexity, Knightian uncertainty, creativity) leads to the insight that different theoretical and empirical approaches might be necessary for analyzing innovation processes. Therefore, the concept of innovation competition requires the combination of different theoretical approaches for explaining the innovation dimension of market competition. As a consequence, we also will have to take into account dynamic or evolutionary concepts of competition (Schumpeter, Hayek) and evolutionary approaches to innovation economics in addition to the contributions of mainstream industrial organization models (Metcalf 1998, Linge 2008, Sidak/Teece 2009, Kerber 2011).

These particular characteristics of innovation processes, which lead to a certain unpredictability of the specific outcomes of innovation processes, and the possibility that important (even revolutionary) innovations can emerge also entirely unexpected from anywhere, have raised the question whether policy-makers have enough knowledge about determinants of innovation for applying policy instruments for promoting innovation in a way that leads to more benefits than harm. This question is relevant for all kinds of policies for promoting innovation, as, e.g., technology policy (subsidies) or intellectual property. It is certainly also relevant for the question to what extent competition law and, in particu-

lar, merger policy should take account of innovation effects. The main concern of many legal scholars and economists about the consideration of innovation in competition law is that the activities of the competition authorities might lead to more harm than benefits for innovation. In competition policy (as in any other economic policy) a balancing has to be made between the possible advantages of protecting innovation competition and the danger of harming society by making wrong decisions (market failure vs. state failure). However, the problem that specific innovation processes might be hard or impossible to predict does not mean that research in competition and innovation economics has not found a lot of important insights about determinants and patterns of innovation competition, which can be used in the application of competition law in order to protect innovation competition.³

The debate about innovation effects of mergers has taken place in the U.S. antitrust policy discussion mostly within the "Schumpeter vs. Arrow" framework. In his later work, Schumpeter (1942) claimed that large firms and firms in highly concentrated (or even monopolistic) markets might be particularly innovative. This led to the famous two Schumpeter hypotheses about a positive link between (1) the size of a firm and innovation and (2) firm concentration and innovation. Larger firms and/or firms with larger market power might have advantages of financing R&D projects (through past profits or an easier appropriation of future profits), of risk diversification, and other innovation efficiencies. These hypotheses about a correlation between market structure and innovation fitted also very well into the empirical research program of the structural approach of the Harvard School, which asked for the identification of optimal market structures (Scherer/Ross 1990). If the Schumpeter hypotheses would be true, then merger policy would face a difficult trade-off-problem between competition and innovation, because mergers leading to higher concentration might promote innovation.⁴ Arrow (1962) offered an important counterargument to these arguments. Starting from a public good model of innovation, Arrow could show that under the assumption of perfect patent protection firms in a competitive environment have higher incentives to invest in R&D (for process innovations) than a monopolist (or, more generally, a firm with market power), because a firm with market power would cannibalize (to a certain degree) its own previous profits ("replacement effect"). From such a perspective, higher firm concentration would lead to lower innovation incentives. With two powerful theoretical arguments why mergers might lead to more or less innovation and the empirical question of the causal relationship between firm concentration and innovation, the stage was set for the development of a rich, and very differentiated theoretical and empirical literature, whose results we will briefly summarize in the next subsections.⁵

³ See for this discussion, e.g., Katz/Shelanski (2007a), Shapiro (2012), and from the perspective U.S. courts Ginsburg/Wright (2012).

⁴ In Europe, this argument was also used to substantiate industrial policy arguments about the promotion of national champions.

⁵ For other broad overviews about the existing theoretical and empirical knowledge about competition and innovation see Gilbert (2006, 2008a), in regard to the relation between firm concentration and innovation Katz/Shelanski (2007a, 13-31), and in defence of the "Innovation Market Analysis", also Carrier (2008).

2.2.2 Theoretical Models and Reasonings

In the model-theoretic literature about the interdependencies between competition and innovation it is important to distinguish between a group of models, in which the innovation incentives of firms are influenced only by competition for innovation itself (e.g., in order to get a patent or to realize first mover advantages), and another group, in which the incentives to innovate are also influenced by pre-innovation product market competition (e.g., pre-innovation profit margins as in the model of Arrow). This distinction shows the importance of clarifying carefully the links between already existing product markets and innovation competition, which can be very different.

One important strand of models which belong to the first group of innovation competition without a relevant link to existing product market is based on the idea of patent races (Loury 1979, Dasgupta / Stiglitz 1980, Lee/Wilde 1980, Reinganum 1983, 1989). A crucial assumption in these models is that only one of the participating firms can win the race (winner takes it all). The firm that discovers a particular technology first is the winner of the race and gets all the profits (patent). Since these models assume a perfect patent protection, each firm taking part in such a race has a strong incentive to be the first to invent, leading to a faster development of new products or technologies. Modifications of the patent race models account for the role of knowledge in the innovation process. For instance, Fudenberg et al. (1983) modelled a dynamic patent race with two stages with asymmetries between the firms in regard to their knowledge stock. As a consequence, the intensity of innovation competition can change with the firms' distance in progress within the patent race (modelled by progress in the accumulation of knowledge). If one firm is able to outpace the others, the laggard firms might decide to give up and drop out of the race. Therefore, it is also crucial whether these models allow for leapfrogging (the possibility that laggard firms can catch up with the leader), or not.⁶

However, a crucial assumption of the patent race literature is perfect patent protection. Whenever the firms are unable to protect their innovations fully by intellectual property rights, intense innovation competition can also lead to appropriability problems due to knowledge spillovers to other imitators and other innovators. On one hand, this can lead to the well-known problem of underinvestment in R&D. D'Aspremont/Jacquemin (1988) demonstrated that in this case mergers can foster innovation if they lead to a larger internalization of knowledge spillovers, because this would increase innovation incentives. On the other hand, imperfect intellectual property rights also influence the incentives in innovation competition itself (as shown, e.g., in Scherer/Ross 1990, Kamien/Schwartz 1976, and Stewart 1983).

This stems from the fact that under insufficient intellectual property rights the benefits of an innovation have to be shared with other firms, and therefore the revenues of each single firm declines with an increase of the number of innovation competitors. Scherer/Ross (1990, 630-637) analyzed the incentives to undertake product innovation-oriented R&D under imperfect patent protection in dependence from the number of firms. They can show that a larger number of firms leads to a faster innovation process due to higher incentives to invest in R&D ("stimulus factor"), but that due to the sharing of the

⁶ For models that allow for leapfrogging see, e.g., Harris/Vickers (1987), Doraszelski (2003), Grossman/Shapiro (1987), Lippman/McCardle (1987).

market with other innovators and imitators the revenues for the single firm decrease, leading to the opposing "market room factor". However, if there are too many firms, then the revenues of each firm are too small for recouping their R&D costs and the danger arises that the entire innovation process breaks down. This resembles similar earlier results of a different model of Kamien/Schwartz (1976), in which an increase in the intensity of competition, defined as the probability that one of the other firms innovates in the next period (hazard rate) and therefore can reap as innovating firm higher profits than an imitating firm, also leads to faster innovation through more innovation incentives, however only up to a certain limit. If competition intensity is getting too large, then the innovation incentives drop again. Therefore, models that do not allow the firms to protect their innovations perfectly by intellectual property rights lead often to an inverted-U shape kind of relation between competition and innovation.

This shape of an inverted-U was also claimed in articles of Aghion et al. (2001, 2005). However, here the authors also included pre-innovation product markets. By differentiating between sectors with "neck and neck competitors" and those with "leading-" and "laggard competitors", they showed that strong competition as well as market power can foster innovation, depending on whether the incentives to strive for "Schumpeterian rents" or the incentives to reap a so-called "escape-competition effect" outweighs the other. The results of Boone (2000, 2001) are also in line with these findings. In one model he found that in industries with weak competitive pressure the least efficient firm of the industry innovates, whereas in industries with intense competitive pressure the leader innovates and increases its dominance. In contrast to Aghion et al. (2001, 2005), Boone (2001) did not assume differentiated but homogeneous products. Hence, regarding the models which analyze the interdependency between competition and innovation by relying (also) on pre-innovation product markets, it is furthermore important to consider how competition on these pre-innovation markets is modeled. For instance, Aghion et al. (2001, 2005), Qiu (1997), Lin/Saggi (2002), and Sacco/Schmutzler (2011) modeled competition intensity by relying on the degree of product substitutability. It is also important whether competition is assumed to be characterized by making decisions about prices (e.g., Aghion et al. 2001, 2005; Cellini/Lambertini 2011), or quantities (e.g., Katz/Shapiro 1987; Ceccagnoli 2005; Sacco/Schmutzler 2011). Another important distinction is whether the incentives for product or process innovations are analyzed. For example, Dutta et al. (1995) and Schmutzler (2010), who focused particularly on the effect of competitive pressure, found that the incentives to strive for product or process innovations can be different. Hence, for models that rely also on pre-innovation competition it is important whether they address process or product innovations.⁷ By differentiating between incumbent firms and potential entrants, other authors, showed that a monopoly might also have strong incentives to innovate due to the maintaining of its monopoly power by patenting new technologies before potential competitors (Gilbert/Newbery 1982).

Other groups of theoretical approaches to innovation competition are based upon new research about the specific characteristics of high-technology industries and the "new economy" as well as basic ideas of the early Schumpeter, Hayek, and evolutionary approaches to innovation economics. Due to the specific characteristics of the information-technology industry and the internet economy (rapid techno-

⁷ See, e.g., the models of Boone (2000), Bonanno/Haworth (1998), Dutta et al. (1995), Schmutzler (2010), Yin/Zuscovitch (1998), and Vives (2008).

logical progress, high fixed costs and small variable costs, huge network effects with the tendencies of winner-takes-all races / natural monopolies etc.) a broad literature emerged which emphasized the particular problems that antitrust authorities face in these "dynamically competitive" high technology industries. In these (Schumpeterian) industries markets are hard to define and market shares do not reflect the competitive positions of firms, especially because also market leaders might lose their dominant position through new innovations very fast ("creative destruction"). In this respect, also a new discussion emerged about the concept of "dynamic competition" for grasping innovation competition in contrast to the well-established concept of "static (price) competition".⁸ This discussion, however, hints to the much older research about Schumpeterian concepts of dynamic competition, based upon Schumpeter's "Theory of Economic Development" (Schumpeter 1911/1934) with his concept of competition as a rivalrous process of innovation and imitation.⁹ Whereas Schumpeterian approaches directly address innovation and imitation as part of market competition, Hayek (1978) started from the knowledge problem and viewed "competition as a discovery procedure", in which firms search for better knowledge in regard to products and production technologies in a trial and error process. Market competition can therefore be seen as a process, in which new knowledge is generated through a process of parallel experimentation with different problem solutions and mutual learning through imitation. Both the Schumpeterian and the Hayekian concept of competition can therefore be analyzed also as an evolutionary process of variation (innovations of firms) and selection (through the market). The evolutionary approaches to competition and innovation try to take explicitly into account the specific characteristics of innovation processes, as "true uncertainty" (Knight 1921), heterogeneity, openness, and the impossibility to predict specific outcomes of innovation processes.¹⁰ In evolutionary innovation economics a rich and broad body of literature about theoretical models and empirical studies about innovation has emerged, which can be used for analyzing innovation effects in competition law contexts.¹¹

In what respect can these evolutionary approaches be relevant for competition law and merger policy in particular? On one hand, they emphasize the knowledge problems of competition authorities due to the difficulties of predicting future competition and innovation processes. On the other hand, they also allow for a better understanding of the value of a decentralized search for innovation, in which due to high complexity nobody knows what the best solutions are, and in which heterogeneous firms with different knowledge and capabilities search independently from each other for new innovations, and can mutually learn from their successes and failures. In evolutionary economics, it can be explained

⁸ For these discussions, see as overview Evans/Schmalensee (2002), Pleatsikas/Teece (2001), Sidak/Teece (2009).

⁹ See as overviews for the U.S. Ellig/Lin (2001) and for former German approaches of dynamic competition Kerber (1994, 1997).

¹⁰ For explicitly evolutionary concepts of competition based upon Schumpeter and/or Hayek, see Kerber (1997, 2011) and Metcalfe (1998).

¹¹ For evolutionary approaches to innovation see as overviews Nelson (1995) and Cantner (2011) with many references. These evolutionary approaches to competition and innovation are also compatible with the "dynamic capabilities" approach (Teece 1986, Teece/Pisano/Shuen 1997) and the "resource-oriented view" of the firm in the innovation management and strategic management literature; see Montgomery (1995) and for the link to merger policy Kern/Ackermann (2014) with many references.

why the existence of a multitude of firms with different capabilities can lead to more innovation, because more and different research paths are tried out. From that perspective, the diversity of an existing population of firms (number of firms and their heterogeneity) in market competition can have a large value (with some analogy to the economics of biodiversity) (as an overview: Kerber 2011). In a small article Farrell (2006) has called this "econodiversity" as one of the crucial (but also so far ignored) benefits of competition and asked whether competition law should "seek to protect such diversity" (Farrell 2006, 166). An application of this evolutionary argument in merger policy would imply that a merger might have negative effects on innovation because the number of independent entities that search for new problem solutions (e.g., parallel research projects) decreases, leading to less parallel experimentation, and therefore to less generation of new knowledge through a process of mutual learning.¹² In the economics of parallel research the trade-off between these advantages of parallel experimentation and its costs through cost duplication and economies of scale and other synergy effects in regard to innovation are analyzed.¹³ We think that some reasonings of antitrust authorities in U.S. merger cases (later in section 3 called "diversity arguments"),¹⁴ could be interpreted (and perhaps better explained) from such an evolutionary perspective. Important is that from this perspective, mergers can have an additional negative effect on innovation, which is entirely independent from the innovation incentive arguments that are analyzed in the industrial organization literature above.

2.2.3 Empirical Results

Theoretical analyses how firm concentration (and therefore indirectly also mergers increasing firm concentration) might influence innovation have provided a rich and very differentiated picture that shows that firm concentration is an important determinant but that its influence can depend on a number of other relevant determinants. What are the results of the empirical studies? First, we will ask about the empirical evidence in regard to the two Schumpeter hypotheses, especially the link between firm concentration and innovation. Secondly, we will summarize the findings of empirical studies that have directly analyzed the impact of mergers on their innovative activities.

There is a broad consensus in the empirical literature that both Schumpeter hypotheses about a general positive link between firm size respective firm concentration on one hand and innovation on the

¹² For a simulation model see Kerber/Saam (2001). In regard to parallel research in the pharmaceutical industry, see also Comanor/Scherer (2013).

¹³ See, e.g., Nelson (1961), Cohen/Klepper (1992), Linge (2008), and Kerber (2011) with many references.

¹⁴ This refers particularly to pharmaceutical merger cases as, e.g., the Glaxo-Wellcome case, in which the agencies argued that the merger would decrease the number of research and development tracks, and tried to maintain competition between parallel research projects through divestiture. Another example is the Northrop/Lockheed case, in which the DOJ was interested "to maintain a number of firms with the capability of innovating to meet future national security challenges" (Robinson 1999, 13). Also the safe harbour solution in the Antitrust Guidelines for Licensing Intellectual Property (1995) of at least 5 independent entities with capabilities for innovation fits well into such an evolutionary perspective on innovation. See for more detailed analyses of these and other cases from an evolutionary perspective Kerber (2011) and Kern (2014).

other hand could not be confirmed empirically.¹⁵ While some authors (Scherer 1965, Scott 1984, Levin/Reiss 1984, Levin et al. 1985) did not find any correlation between concentration and R&D, Link/Lunn (1984) and Lunn/Martin (1986) identified a positive link between concentration and R&D. Most interesting was that Scherer (1967), Mansfield et al. (1977) as well as Culbertson/Mueller (1985) could identify a positive interrelationship between concentration and R&D, but only up to the threshold of a moderate firm concentration (Scherer 1967: C4 of 50-55%; Culbertson/Mueller 1985: C4 of ca. 60% as critical thresholds), which would have confirmed the hypothesis of an inverted U-curve, as it was theoretically suggested by, e.g., Kamien/Schwartz (1976) or Scherer/Ross (1990). These empirical findings were confirmed most recently by the studies of Aghion et al. (2005) and Polder/Veldhuizen (2012). Besides this, Angelmar (1985) indeed identified a positive correlation between concentration and R&D intensity, but solely for industries with low barriers to imitation. For industries with high imitation barriers, he found a negative correlation. Furthermore, Lunn (1986) found that patents for process innovations in low-tech industries are positively related to concentration. However, for product patents or process patents in high-tech industries he did not find any effects. Overall, the results of these studies show clearly that no general stable relationship between firm concentration and innovation that is valid across all sectors could be found, although there is considerable empirical evidence that neither a very low firm concentration nor a very high concentration might be very conducive for innovation (Scherer/Ross 1990, 644; Gilbert 2006, 187).

All of these empirical studies suffer to some extent from the problem that they have focussed on the relationship between firm concentration on the industry level and innovation. Industry concentration is very different from firm concentration on product markets or innovation competition, on which most of the theoretical literature has focussed. Also for antitrust authorities in merger reviews it is the firm concentration on the relevant markets that is relevant, and not firm concentration on the industry level. However, as we will see later in more detail, firm concentration at the level of product markets might also not be very suitable for assessing the effects of mergers on innovation competition, because the firms competing for innovation might not be identical to those on the current product market. Therefore, empirical studies using industry concentration might also allow for a broader picture of the competitive structure of an industry and help to shed some light on the competitive conditions for innovation competition.¹⁶ However, due to these shortcomings, it is interesting to look at empirical studies which try to approach the problem more directly and avoid using firm concentration at the industry level.

Such a rather direct approach is provided by the empirical study of Tang (2006) who tried to capture the competitive pressure (regarding innovation) by using data on firms' perceptions about their competitive environment (survey data during the period of 1997–1999). He defined four types of competition: (1) easy substitution of products, (2) constant arrival of competing products, (3) quick obsoles-

¹⁵ For comprehensive overviews see Scherer/Ross (1990, 613-660), Gilbert (2006), and Cohen (2010).

¹⁶ However, since industry classifications are quite an artificial construct (originally developed for national accounting) and often quite broad (even on 3 or 4 digit levels), many of the firms in the same industry might not consider themselves as competitors, neither in regard to existing products (pre-innovation markets) nor with respect to innovation (innovation competition).

cence of products, and (4) rapid change of production technologies. The study showed that competitive pressure is generally positively correlated with innovation, but that easy substitution of products has a negative impact on product innovations, whereas a quick obsolescence of products had a positive effect on product innovations, but a negative one on process innovations. Another study which avoids relying on industry concentration was conducted by Kukuk/Stadler (2005). By using (also questionnaire based) data from the Centre for European Economic Research (ZEW) survey, they examined the influence of technological rivalry, market power, technological opportunities and demand expectations on the planned timing of innovations. The study showed that market structure is indeed an important explanatory factor when it comes to analyzing innovation behaviour. However, it is not the number of competitors in the pre-innovation or post-innovation product market but the number of rivals participating in the innovation race that strongly influences the innovative dynamics of firms.

The study of Park/Sonenshine (2012) about the "Impact of Horizontal Mergers on Research and Development and Patenting" used a very different approach. They used the assessment of the U.S. anti-trust authorities DOJ and FTC about whether a merger would lead to anticompetitive concerns due to an increased market concentration as criterion for separating between different samples of mergers, one in which the agencies saw a problem and challenged them, and other ones which were not challenged by the authorities. The authors compared the innovation behaviour of such a sample of R&D-intensive challenged mergers to a similar sample of non-challenged mergers and to a control group of non-merged firms. As a result, Park/Sonenshine (2012) found that firms, whose mergers were challenged by the authorities because of a substantial increase in market power, undertook significantly less innovation efforts after the transaction took place, than they otherwise would have without the merger. Firms whose mergers were not challenged did not innovate differently from how they would have done, if they had not merged. These results suggest that mergers at such a high concentration level that they are challenged by the antitrust authorities seem to have a negative impact on innovation in comparison to other mergers or comparable firms which do not merge.¹⁷ This study is already close to the following number of empirical studies about the direct effects of mergers on innovation.

De Man/Duysters (2005) presented a meta-study about the empirical literature on the impact of mergers on innovation. It is very remarkable that their review did not identify a single study showing a positive impact of mergers on innovation. Hitt et al. (1996) and Hall et al. (1990), for instance, found that leverage financing of mergers increases the capital costs of the firms, leading to a relative scarcity of financial resources for R&D. There is also a number of studies which were not considered in the review of de Man/Duysters. James et al. (1998, pp. 566) found that managers tend to overestimate short-term financial targets in comparison to long-term strategic goals. Since R&D activities require long-term investments and strategic planning, innovation often suffers from M&A. Grimpe/Hussinger (2007) found empirical evidence that the prices paid for target firms, which hold patents capable to block competitors, are higher, if these patents are closely related with the patent portfolio of the acquiring firm. The study of Cloudt, Hagedoorn and Van Kranenburg (2006) examined the post-merger innovative performance of 347 firms in four major high-tech industries. For this purpose they analyzed

¹⁷ Please note that their method could not determine whether the antitrust authorities saw any specific concerns in regard to innovation, or whether they challenged due to static price concerns.

2429 M&A events within the period of 1985–1994. In contrast to Ahuja/Katila (2001) they found that non-technological mergers generally had a negative impact on the acquiring firm's innovative performance, while the impact of technological M&As appeared to have a more ambivalent influence. This ambiguity is caused by the observation that the absolute size of the acquired knowledge base had a positive effect on the innovative performance of the acquiring firm during the first two years. However, after this initial positive impact, the effect turned around and the authors observed a negative effect on the innovative performance. In regard to the impact of the relative size of the acquired knowledge base and the post-merger innovativeness of the acquiring firm, the results did, just as the study of Ahuja/Katila (2001), show only a negative impact. Apart from this, also their study revealed that the relatedness between the target and acquiring firms' knowledge bases appears to have a curvilinear impact on the merging firms' innovative performance. The authors, therefore, concluded that acquiring firms should, in order to improve their innovative performance, "target M&A 'partners' that are neither too unrelated nor too similar in terms of their knowledge base" (Cloudt/Hagedoorn/Van Kranenburg 2006, 642).

Stahl (2010) also investigated the relationship between innovation and merger decisions. Just as Cloudt, Hagedoorn and Van Kranenburg (2006) she relied on patent counts in order to measure the firms' innovativeness. However, since she explicitly accounted for sequential innovations, she also used patent citations in order to retrace the paths of these sequential innovations. Stahl (2010) found evidence that the rate of sequential innovation indeed increases in the years preceding a merger. But, similar to the observation of Cloudt, Hagedoorn and Van Kranenburg (2006), this rate appeared to decline in the years following a merger. She, therefore, states that her results support the suggestion that "[...] mergers are motivated more by the desire to dampen competition than by the desire to capture information spillovers" (Stahl 2010, 4). This bad performance over time was also highlighted by Danzon, Epstein and Nicholson (2007) who investigated the M&A effects for large and small firms in the pharmaceutical/ biotechnology industry. In comparison to previous findings of Higgins/Rodriguez (2006), which, however, used a smaller sample, the authors did not find evidence that, in the long run, mergers have a positive effect on the innovative performance of large firms. The pharmaceutical industry was also the basis for the study of Ornaghi (2009). By using data from 1988 to 2004, he examined the effects of M&A on the R&D activity of consolidated firms for investigating the relationship between the ex-ante relatedness of the merging firms and their post-merger performances. Also his results suggest that merged firms have, on average, a worse performance than their counterparts of the control group of non-merging firms. Besides this, he furthermore found that a higher level of technological relatedness cannot be linked to an improvement regarding the R&D outcome.

Nevertheless, even though the empirical literature on mergers and innovation appears to deliver quite consistent results which indicate that the impact of M&A on the innovative performance of firms can be expected to have a negative (long-term) effect, there are also a few studies which indicate that there might also occur a positive effect. For instance, Zhao (2009) investigated how successful acquisitions and lost bids affect the innovative performance of the corresponding firms in the following three years. He finds that firms, which were less innovative before the bid, benefit stronger from acquisitions. He, therefore, concludes that: "technological innovation affects firms' acquisition decisions, and in turn,

acquisitions help firms' innovation efforts" (Zhao 2009, 1170). However, he also found that the firms, which engage in acquisition activities, are generally less innovative firms and that, among these (less innovative) bidding firms, the relatively more innovative ones are less likely to be the successful acquirer. Hence, the positive effect, identified in this study, seems to account for the special case of underperforming firms/laggard firms which are enabled to return/catch up as a consequence of the acquisition.

2.2.4 Conclusions

In this section 2.2, we saw that a large number of theoretical and empirical studies exist that are relevant for the question of innovation effects of mergers. What conclusions can we draw from the results of these studies? First, the results both from theoretical models as well as empirical studies confirm clearly that mergers either directly or through increasing market concentration can have considerable negative effects on innovation. It is interesting that the most direct empirical studies, namely those about the effects of mergers on the innovation of these merging firms themselves seem to provide nearly unanimously support for raising considerable concerns about negative innovation effects of mergers. Therefore, the question for negative innovation effects of mergers should be an important concern for antitrust authorities in merger reviews. Secondly, however, both from a theoretical and an empirical perspective no general stable relationship between market structure and innovation has been found. As well as there is no general optimal firm size for innovation, also no optimal market structure for innovation can be defined, although the hypothesis of some kind of inverted U-curve is still on the table (meaning that both a too high and too low concentration might be less conducive for innovation). However, a closer look at the many sector-specific studies on innovation would show that the determinants of innovation might be very different between different sectors. This leads, thirdly, to the conclusion that the innovation effects of mergers might be very different under different circumstances, e.g., different appropriability conditions (including intellectual property protection), in regard to product and process innovations, low or high barriers to entry (financial and knowledge resources), the size of technological opportunities, and, particularly, the different economic and technological conditions of different sectors. These insights suggest that any assessment framework for innovation effects of mergers should be capable of a differentiated analysis with a number of assessment criteria, and firm concentration might not be the most important one (as it is also no more in regard to price competition).

2.3 Assessment Concepts for Innovation Effects of Mergers

2.3.1 Introduction

In the last section 2.2 we gave an overview about our general theoretical and empirical knowledge in regard to innovation effects of mergers. In this section we discuss the issue of a structured investigation and decision approach, which allows competition authorities to distinguish as good as possible between problematic mergers that impede competition and harm consumers and unproblematic mergers with no significant anticompetitive effects. From an economic perspective this can be seen as a decision-theoretic problem, in which the competition authority should minimize the sum of costs through erroneous decisions (welfare losses through "false positives" and "false negatives") and investigation costs (error cost approach). The problem of optimal structuring such an investigation and decision process includes the questions for suitable investigation and assessment criteria that allow for identifying problematic mergers, for an optimal sequencing of this process, for the use of presumptions (as, e.g., in safe harbour rules), and rules for burden of proof.¹⁸ In regard to innovation effects of mergers the debate about the suitability of the traditional product market approach or the necessity of a more innovation-specific approach as well as the applicability of general presumptions about any negative innovation effects of higher firm concentration can be seen as important parts of this search for a suitably structured investigation and decision framework for mergers in regard to innovation effects.

Both in the U.S. and the EU a well-established basic structure of merger reviews exists: Market definition is followed by a competitive assessment of mergers (including both anticompetitive effects as well as efficiencies) and the analysis of potential remedies. Without market definition it is not possible to calculate market shares as well as measures of market concentration, which still play an important role, (1) as one of the assessment criteria in a deeper case analysis but (2) also as a first (sorting) criterion for distinguishing unproblematic mergers from potentially more problematic ones which require a deeper analysis. In the product market approach the competition authorities define the markets by focusing on the current products and identify the relevant competitors by investigating in a step-by-step approach whether the firms in the market (if they would act as a hypothetical monopolist) could profitably increase prices permanently for 5 - 10% (SSNIP: "small but significant non-temporary increase in price") or whether - due to demand or supply substitution - additional products (and firms) have to be included into the market. In the meantime, a lot of quantitative investigation methods exist (as, e.g., critical loss analysis) for carrying out such analyses in specific cases.¹⁹ This approach can be found both in the relevant U.S. and EU guidelines about market definition and the assessment of mergers, and is also well-accepted in competition economics. Within such a traditional product market approach, the investigation of innovation effects of mergers would be included as part of the second step, the competitive assessment of the merger.

¹⁸ For an economic analysis of such an approach see Easterbrook (1992), Christiansen/Kerber (2006) with many references; for an explicit decision-theoretic approach Beckner/Salop (1999) and Kerber/Kretschmer/Wangenheim (2012). In regard to merger policy, a decision-theoretic approach was also suggested by Katz/Shelanski (2007b).

¹⁹ See for an overview Kerber/Schwalbe (2008, 263-277); we will see later in section 4.2 that this is also the approach of the U.S. Horizontal Merger Guidelines of 2010 (DOJ/FTC 2010).

The crucial question is whether this traditional product market approach is also capable of dealing with negative effects of mergers on innovation competition. A very fundamental first critique is that the entire approach of defining markets with the current products of the firms is a purely static approach that might be only helpful in regard to analyzing scopes for price increases of these current products but is not suitable for assessing competitive conditions for the innovation of new products, which would change these markets. Directly linked to this is the widely acknowledged insight that the current market shares of the incumbent firms in a market might not be a good indicator for assessing competition in regard to innovation: On one hand, market shares in regard to current sales might not say much about the strength of the innovation activities of the firms (Evans/Schmalensee 2002, 16). On the other hand, the relevant innovating firms might not even be identical with the current incumbent firms on a product market. Some of the firms in the current product market might not invest in R&D and are therefore no innovation competitors, at the same time other firms from outside the market might compete with the innovation activities of incumbent firms. Using the market definition of the product market would identify a wrong set of relevant competing firms, and therefore lead to wrong assessments of innovation effects of mergers (Kern 2014, 174). One important group of cases are mergers of incumbent innovating firms with innovating firms from outside the product market. In these cases innovation competition might be impeded, although there is no accumulation of market shares.²⁰ But it might also be that the merger of two innovating incumbent firms might be less problematic, because there are a number of additional non-incumbent innovation competitors. Another group of cases refers to situations, in which innovating firms compete with their R&D for solving a certain problem but so far no current product market exists.²¹

2.3.2 Innovation Market Analysis

The "Innovation Market Analysis" proposed by Gilbert/Sunshine (1995) was an explicit attempt to incorporate dynamic efficiency concerns more directly into the merger analysis of U.S. antitrust law. They proposed a 5-step-procedure for identifying the relevant innovation competitors and the possible anticompetitive and efficiency effects. Their basic idea might be best explained by looking at the "Anti-trust Guidelines for the Licensing of Intellectual Property (DOJ/FTC 1995), where they found their first recognition in an official antitrust document. In these guidelines the U.S. agencies distinguished between three different kinds of markets: product markets, technology markets, and innovation markets. Technology markets are markets for technology as the result of R&D, which, e.g., might be protected by patents and therefore can be traded. Technology markets are very similar to product markets and pose no new conceptual challenges in regard to their definition. This is different with innovation markets. In these antitrust licensing guidelines it is explicitly argued that competition to develop new or

²⁰ Another related case is that the merging innovating firms are in the same product but in different geographical markets (as, e.g., in the case General Motors /ZF Friedrichshafen).

²¹ See Glaxo plc, 119 F.T.C. 815 (1995); Ciba-Geigy Ltd., 123 F.T.C. 842 (1997); American Home Products Corp., 119 F.T.C. 217 (1995); Pfizer Inc. and Warner-Lambert Co., FTC Dkt. No. C-3957 (June 19, 2000); Baxter Int'l, Inc., 123 F.T.C. 904 (1997); The Upjohn, Co., 121 F.T.C. 44 (1996); Glaxo Wellcome plc, 131 F.T.C. 56 (2001).

improved products and processes might not be addressed adequately through the analysis of goods or technology markets. Then separate innovation markets might be defined in the following way:

"An innovation market consists of the research and development directed to particular new or improved goods or processes, and the close substitutes for that research and development. The close substitutes are research and development efforts, technologies, and goods that significantly constrain the exercise of market power with respect to the relevant research and development, for example by limiting the ability and incentive of a hypothetical monopolist to retard the pace of research and development. The Agencies will delineate an innovation market only when the capabilities to engage in the relevant research and development can be associated with specialized assets or characteristics of specific firms" (DOJ/FTC 1995, 11).

Therefore, the crucial idea of the "innovation market analysis" is the identification of the relevant competitors in innovation competition through the identification of overlapping (substitutive) R&D activities combined with the identification of specialized assets that are necessary for this kind of R&D, which can also be interpreted as barriers to entry for innovation. If no such necessary specialized assets can be identified, then Gilbert/Sunshine (1995, 588) would not recommend the definition of separate innovation markets. After this definition of the innovation market, the innovation market analysis concept would require an analysis whether the merged firms would have the capabilities and incentives for reducing or slowing down their R&D activities either through unilateral or coordinated behavior or whether other competitors would make such strategies either not feasible or not profitable. Such an analysis would be followed by the possibility of counterbalancing any anticompetitive effects of innovation through innovation-related efficiencies (Gilbert/Sunshine 1995).

It is well-known that the "Innovation Market Approach" was - and still is - heavily criticized by many lawyers and economists. From a primarily legal perspective it has been claimed that the U.S. antitrust law would not support an approach like the one introduced by Gilbert and Sunshine (Hoerner 1995). Other authors complained that the "Innovation Market Analysis", by focusing on R&D efforts, would only maximize the inputs (R&D) instead of directly targeting the relevant output (innovation) (Hoerner 1995, 52; Rapp 1995, 33; Morse 2001, 32; Carlton/Gertner 2003, 10). Another important concern was that, also due to asymmetric information, the agencies would not be able to identify the actual competitors on a particular innovation market (Rapp 1995, 27; Carlton/Gertner 2003, 15).²² In the following, we want to focus primarily on two specific critical arguments: The first one refers to argumentations that the "Innovation Market Analysis" would not be necessary, because other approaches as the "potential competition" doctrine (Hay 1995, Rapp 1995) or the "future market" concept (Kent 2011) are sufficiently capable of dealing with those innovation effects of mergers. The second one refers to the concern that since there does not seem to exist a clear linkage between market structure and innovation no general presumptions can be applied that a higher firm concentration would lead to negative effects on innovation (Hay 1995, Rapp 1995, Davis 2003, Muris 2004).

²² For a defence of the "Innovation Market Analysis" against these criticisms see Carrier (2008).

2.3.3 Potential Competition and Future Market Concept

Can negative innovation effects of mergers be taken into account by the "potential competition" concept?²³ Firstly, the "potential competition" concept had always been defined in regard to the question how firms from outside the market limit the scope for price increases of incumbent firms in a product market.²⁴ Secondly, the arguments about how to use the "potential competition" concept for assessing the innovation effects of mergers usually focus on one group of cases, in which an incumbent firm already offers a product on a market and buys another firm outside the product market which has a new product in the pipeline, which would compete with the product of the incumbent after market introduction. In that case, the second firm can be seen as a potential competitor, and the merger as threatening future competition on that product market. Although the merger might also impede innovation, the main concern from the potential competition perspective is here the loss of future price competition on the already existing product market. Such an application of the "potential competition" concept is not about innovation competition but about (future) price competition. The potential competition concept also cannot be used for groups of cases, in which so far no product markets exist. However, also in the cases, in which the potential competition concept is applicable, the antitrust authorities still need to identify the innovation activities of those potential competitors, which requires similar analyses as the "Innovation Market Analysis" concept would suggest.

What about the suitability of the "future market" concept?²⁵ This concept is particularly interesting in cases, in which so far no product markets exist but the (merging) firms compete with their R&D projects for developing new products, which would lead to a future product market. In this group of cases, mergers between these firms might lead to the problem that fewer R&D projects are finished, leading to the introduction of fewer products on such a future product market. Again, the question emerges what kind of competition the antitrust authorities want to protect in their merger review: Is it really innovation competition between the innovating firms or is it price competition on the future product market? The authors who see the concept of "future markets" as a clearer approach compared to "innovation markets" seem to interpret the "future market" in the latter sense, i.e. that they see it as a future product market, and that they want to protect (price) competition on this future product market. Although this is a legitimate concern, because getting less price competition on a future product market through less innovation would harm consumers, such an application of the "future market" concept would not focus on the protection of innovation competition itself. If, however, the future market approach would be applied in a way that attempts to protect innovation competition, then we also would have to identify the innovation activities (e.g., R&D projects) or specialized assets necessary for this kind of innovation in order to identify the firms that compete for innovation in regard to a future product market, and ask about the effects of a merger upon such a process of innovation competition. The questions that have to be answered would be the same as suggested by the "Innovation Market Analysis" approach.

²³ The arguments of this section about the suitability of the "potential competition" and "future market" approach are based also upon the much more detailed analysis in Kern (2014), which also entails the analysis of specific merger cases.

²⁴ See the definition of entry barriers in Bain (1956) or the theory of contestable markets (Baumol/Panzar/Willig, 1982).

²⁵ See generally Baxter (1985), Lang (1997), and Landman (1999).

Our comparative analysis of the suitability of the "Innovation Market Analysis", the "potential competition" concept, and the "future market" concept for assessing innovation effects of mergers leads to the following results: The current concepts of potential competition and future markets can deal with the anticompetitive effects of mergers in regard to less price competition on a current or future product market, because through the merger fewer new products might be introduced into these markets, and therefore firm concentration might be higher on current or future product markets than they would be without the merger. This might harm consumers and should be a concern for competition authorities. However, both concepts cannot take into account the negative effects of the merger in regard to innovation competition itself. For both the theoretical industrial economics models that analyze the incentives for R&D under different market structures and different assumptions and also the evolutionary economics approaches, which focus on the benefits of parallel R&D projects as a parallel experimentation process, the benefits of innovation competition are the welfare increases through more and faster innovation, and not the easing of static price concerns on current or future product markets (see again section 2.2.2).

Therefore, our conclusion is that both the potential competition concept and the future market concept are either not suitable for dealing with anticompetitive effects of mergers on innovation competition or - if applied differently - would have to ask the same questions as the "Innovation Market Analysis" has proposed: It would be necessary to identify the relevant competitors in regard to innovation competition, which either requires the observability of R&D projects (as, e.g., in the pharmaceutical industry) and/or the identification of specialized assets as barriers to entry for innovation competition. If this is not possible, then also the identification of the relevant innovation competitors is not possible and no analysis can be made whether a merger would lead to a substantial lessening of innovation competition or not.²⁶ In this article, we do not want to make a comprehensive assessment of the "innovation market analysis" approach, which would require a much deeper analysis. Our intention here is to show that it was the "Innovation Market Analysis", which has asked the right questions about the identification of the relevant competitors for innovation competition, and that the potential competition and future market concept are not suitable alternative approaches, which would lead to easier and more well-established methods for dealing with innovation competition concerns in merger cases. Therefore the main discussion should be on methods about the improvement of the identification of the relevant competitors in innovation competition (see below section 4.3).

2.3.4 Structured Assessment Approach of Innovation Effects

After the identification of the relevant innovation competitors, a structured investigation and assessment approach would require a clear set of assessment criteria, which are applied in a systematic structured way in order to investigate the positive and negative effects of a merger on innovation competition and their implications for consumers. One simple solution would be the application of a pre-

²⁶ This precondition was always emphasized by proponents of the "Innovation Market Analysis". See Gilbert/Sunshine (1995), Katz/Shelanski (2007a, 43), and also Gilbert/Rubinfeld (2010, 19) in their comment on the reform of the Horizontal Merger Guidelines.

sumption that a certain increase of the relevant firm concentration through a merger might lead to negative innovation effects. This leads back to the above-mentioned critique of the "Innovation Market Analysis" that such general presumptions are impossible due to the unclear relationship between market structure and innovation. For example, in the context of the closing of the Genzyme/Novazyme case at the FTC in 2004, which was a 2:1 merger leading to the elimination of the only other competitor for developing the first drug for the (very rare) Pompe disease, the FTC Chairman Muris (2004) argued that due to the unclear relationship between market structure and innovation, no general presumptions can be used, and therefore fact-dependent analyses of the merger cases should be made.²⁷ Although Katz/Shelanski (2007a, 76-85) agree that there should be no general presumption that the reduction of the number of firms through a merger would lead to negative effects on innovation, in the specific case of a 2:1 merger (monopolization) they recommend a rebuttable presumption of negative innovation effects. This already hints to a more differentiated approach between a simple presumption and a pure fact-dependent analysis).

In light of the overview in section 2.2. about our theoretical and empirical knowledge about innovation effects of mergers, it seems to be clear that a general and unqualified presumption about negative innovation effects of a merger seems to be hardly defensible. It can be presumed that the error costs (from both types of errors, false positives and false negatives) by using a simple presumption are much too high, because we saw in section 2.2 that the innovation effects of mergers might be very different under different circumstances and in different sectors. Therefore from a decision-theoretic perspective, the development of a structured assessment approach is necessary, in which for different sectors and circumstances the innovation effects of mergers should be analyzed in a differently structured way. The rich theoretical and empirical literature about innovation competition can be used as input for developing such a differentiated approach. Such an approach is very close to the well-established practice in competition law for forming a number of groups and subgroups of cases, which are treated differently, both in regard to the relevant assessment criteria but also in regard to the necessary depth of specific case analysis or whether under certain circumstances also presumptions can be used. It cannot be excluded that for certain subgroups of cases, i.e. under certain conditions, also (rebuttable) presumptions about negative innovation effects of mergers might be recommended. So far there is not much research about the problem, how we can derive such a structured investigation and assessment approach from the rich theoretical and empirical literature that we summarized briefly in section 2.2.²⁸

²⁷ For the Genzyme/Novazyme case, see also the dissenting statements of the other Commissioners Thompson (2004) and Harbour (2004) as well as Balto/Sher (2004), Katz/Shelanski (2007a, 81-85), Gilbert (2008b) and Shapiro (2012, 394-398).

²⁸ For contributions that already try to develop first approaches in this direction, see, e.g., Gilbert (2006), Baker (2007), Kern/Mantilla (2014), and for the pharmaceutical industry Carrier (2008). It can also be found in Katz/Shelanski (2007a, 2007b) with an explicit claim for using a decision-theoretic framework.

3. Innovation Effects of Mergers: Analysis of U.S. Merger Policy

3.1 Introduction

Before the 1990s, the impact of mergers on innovation did not play an explicit role in US merger policy. This is corroborated by the fact that the Horizontal Merger Guidelines of 1992 mentioned innovation only once in a footnote (DOJ/FTC 1992, 2, fn.6). However, in the 1990s an increasingly important discussion emerged about the relevance and necessity of considering innovation effects in antitrust law (see, e.g., Yao/DeSanti 1992) and in this context "Innovation Market Analysis" (Gilbert/Sunshine 1995) emerged. Over the last twenty years officials of both US antitrust agencies, the DOJ and FTC, have regularly emphasized the importance of the assessment of innovation effects in regard to their merger reviews (e.g., Robinson 1999, Rosch 2009, 2010). As we will analyze in more detail in chapter 4, the newest version of the US Horizontal Merger Guidelines (DOJ/FTC 2010) entails explicitly rules when and how innovation effects should be considered. Most remarkable, however, is that innovation seems to have played an explicit role in a large number of merger cases in the last twenty years (with a considerable number of innovation-related divestitures as remedies in settlements).

In this chapter, we want to analyze the practice of US merger policy in regard to the assessment of innovation effects by looking empirically at the merger cases of the DOJ and FTC. We are particularly interested in the following questions: (1) To what extent have the agencies considered innovation in their merger reviews? Have innovation effects been a relevant aspect in merger reviews or has it been considered only in rare cases? Have innovation aspects been seen as more relevant in innovation-intensive industries? (2) For those cases, in which innovation aspects have played a role in the assessment, the question arises, how the agencies have assessed these innovation aspects. Did they use the traditional product market concept, as suggested by the Horizontal Merger Guidelines, or did they use a more innovation-specific approach (e.g., along the lines of the innovation market concept)? What kind of specific theoretical reasonings did they mention why a merger should have negative effects on innovation, and what specific assessment criteria did they apply? What kind of remedies did they use in their settlements? Since the assessment of innovation effects of mergers is itself an innovation, a third set of questions is interesting: (3) Did the two U.S. antitrust agencies use the same or different approaches in regard to assessing innovation effects, and can we see a development over time in regard to the extent and methods of assessing innovation effects, e.g. through more experience? In that respect, we should also bear in mind that in the last twenty years three different Administrations (Clinton, Bush, Obama) with different political agendas might have influenced U.S. antitrust policy.

We are not the first asking about the practice of US merger policy in regard to innovation concerns. There are a number of papers which either have analyzed specific merger cases and/or provided some overviews about the general policies of the agencies in regard to the assessment of innovation effects. Perhaps most important are the articles of Gilbert/Tom (2001), Katz/ Shelanski (2007a), and in regard to pharmaceutical mergers Carrier (2008). However, none of these articles have analyzed empirically with an econometric study the U.S. merger cases, especially in regard how the agencies have

tried to assess the innovation effects of these mergers.²⁹ Our analysis here is based primarily upon an empirical study, in which we analyzed all challenged mergers of the U.S. antitrust agencies DOJ and FTC between 1995 and 2008. From our overall data set of 399 merger challenges, the agencies have considered innovation in 135 merger cases, which has been our subset of mergers with innovation concerns, which we analyzed in regard to the above-mentioned research questions. Therefore, our study is the first that analyzes the assessment approach of the U.S. agencies in regard to innovation effects in detail and with quantitative empirical methods. In the following subsections, we will summarize and discuss the results of our study. Both the methodology of our study and the econometric results can be found in more detail in Kern/Dewenter/Kerber (2014). However, in this section we will also present additional descriptive results (not mentioned in our econometric paper) as well as carry out a deeper analysis and interpretation.

3.2 To What Extent Have the U.S. Antitrust Agencies Considered Innovation in their Assessments of Mergers?

During the 1990s the U.S. merger policy started to take innovation effects in merger reviews into account much more seriously. Gilbert/Tom (2001) and Gilbert (2008a) could show that the number of challenged mergers, in which innovation effects were alleged increased considerably between 1990 and 2003 (from 3% of all challenged mergers in the period 1990-1994 to 38% between 2000 and 2003 for both agencies). However, Gilbert also emphasized that in only few of these cases innovation concerns played a crucial role for the agencies, and that these mergers would have presumably also be challenged on conventional static concerns (Gilbert 2008a, 4). Much more unclear is whether this undisputed increase in the 1990s led to a stable policy of including innovation effects in merger reviews or whether the massive critique of the innovation market approach led also to a setback in regard to the consideration of innovation effects in the practice of U.S. merger policy, especially after the closing of the Genzyme/Novazyme case in the beginning of 2004 (see Muris 2004, Gilbert 2008b, Rosch 2009). Since there is a broad consensus that innovation concerns were relevant also after 2003, the question is whether these were only some prominent cases, esp. in the pharmaceutical industry, or whether the inclusion of innovation effects became part of the general merger policy.

²⁹ Gilbert/Tom (2001) and Gilbert (2008a) provide some descriptive statistics about the extent of the consideration of innovation effects. See for qualitative assessments of merger cases, e.g., Davis (2003, 687 et seq.), Morse (2001, 26 et seq.), Rubinfeld/Hoven (2001), Landman (1999), Lang (1997), Kent (2011) and Kern (2014).

Table 1: Assessment of Innovation Effects in Challenged Merger Cases (DOJ and FTC, 1995-2008)

	Σ		FTC + DOJ				Σ FTC		Σ DOJ		FTC				DOJ			
	95-'08		95-'03		04-'08		95-'08		95-'08		95-'03		04-'08		95-'03		04-'08	
	total	%	total	%	total	%	total	%	total	%	total	%	total	%	total	%	total	%
Case level:																		
All challenged mergers*	399	100%	298	100%	101	100%	252	100%	147	100%	189	100%	63	100%	109	100%	38	100%
Cases with innovation aspects**	135	34%	100	34%	35	35%	91	36%	44	30%	67	35%	24	38%	33	30%	11	29%
Market level:																		
Markets with innovation aspects	323	100%	250	100%	73	100%	218	100%	105	100%	162	100%	56	100%	88	100%	17	100%
Innovation in market definition and/or anticompetitive effects																		
Innovation in market definition	222	69%	162	65%	60	82%	179	82%	43	41%	126	78%	53	95%	36	41%	7	41%
Innovation in anticompetitive effects	255	79%	210	84%	45	62%	151	69%	104	99%	123	76%	28	50%	87	99%	17	100%
Barriers to Entry																		
IPRs	62	19%	36	14%	26	36%	52	24%	10	10%	30	19%	22	39%	6	7%	4	24%
Know-how & Experience	195	60%	141	56%	54	74%	128	59%	67	64%	87	54%	41	73%	54	61%	13	76%
Other entry barriers	271	84%	204	82%	67	92%	179	82%	92	88%	129	80%	50	89%	75	85%	17	100%
Only other or inconcrete	97	30%	88	35%	9	12%	63	29%	34	32%	57	35%	6	11%	31	35%	3	18%
Used Concentration Measures																		
HHIs and/or market shares	162	50%	118	47%	44	60%	98	45%	64	61%	67	41%	31	55%	51	58%	13	76%
Number of competitors	124	38%	87	35%	37	51%	81	37%	43	41%	52	32%	29	52%	35	40%	8	47%
Non-quantitative information	81	25%	70	28%	11	15%	70	32%	11	10%	60	37%	10	18%	10	11%	1	6%
Concentration Level																		
Low and medium concentration***	13	5%	11	6%	2	3%	10	7%	3	3%	8	8%	2	4%	3	4%	0	0%
high concentration***	74	31%	64	36%	10	16%	36	24%	38	40%	30	29%	6	13%	34	44%	4	25%
very high concentration***	155	64%	105	58%	50	81%	102	69%	53	56%	64	63%	38	83%	41	53%	12	75%
Theories and Reasonings																		
Innovation incentive arguments	105	33%	73	29%	32	44%	67	31%	38	36%	45	28%	22	39%	28	32%	10	59%
Diversity arguments	23	7%	21	8%	2	3%	14	6%	9	9%	13	8%	1	2%	8	9%	1	6%
Inconcrete reasonings	210	65%	171	68%	39	53%	148	68%	62	59%	115	71%	33	59%	56	64%	6	35%
Static price concerns	272	84%	204	82%	68	93%	168	77%	104	99%	117	72%	51	91%	87	99%	17	100%

Sources: DOJ/FTC Annual Competition Enforcement Reports and Agency complaints (years shown are fiscal years).

* including consent decrees, injunctive reliefs, administrative complaints, abandonments.

** innovation aspects in market definition and/or in anticompetitive effects.

*** low/medium: HHI < 3.000, market shares (ms) < 45%, number of competitors (n) > 4; high: 3000 ≤ HHI < 5000, 45% ≤ ms < 70%, 3 ≤ n ≤ 4; very high: HHI ≥ 5000, ms ≥ 70 %, n ≤ 2.

In our study we could identify 135 mergers of overall 399 mergers that were challenged between 1995 and 2008 by DOJ and FTC, in which the agencies also raised innovation concerns. We defined a merger with innovation concerns as a merger, in which the agencies had mentioned innovation in at least one relevant market, either as part of the market definition or as part of their competitive effects analysis (see more specifically subsection 3.3). Therefore, in a third of all challenged mergers (34%) also innovation concerns were raised. Although the numbers in Table 1 in regard to the share of such innovation cases differ slightly between the DOJ and FTC and between 1995-2003 and 2004-2008, our econometric analysis, which also controlled for the effects that the agencies usually review mergers from different industries, showed clearly that no statistically significant differences can be found between the probability that the DOJ or the FTC raised innovation concerns, and between both periods (Kern/Dewenter/Kerber 2014, 4-10). The latter result strongly supports the thesis that the relevance of innovation concerns has not decreased after 2003. It is also remarkable that the DOJ and FTC considered innovation concerns to a similar extent, because we will see below considerable differences between the agencies in regard to their assessment approaches.

A different question is whether the agencies correctly identified the mergers with innovation concerns. The agencies could have made two kinds of mistakes: On one hand, they could have mistakenly raised innovation concerns on markets, on which no such effects can be expected ("false positive"). On the other hand, the agencies could also have been mistaken in not identifying cases with innovation effects ("false negatives"). In the literature a number of cases are discussed, esp. in regard to the pharmaceutical industry, in which the use of innovation markets and/or the alleged innovation effects are criticized, leading to an allegation of identifying too often or too rarely mergers with negative effects on innovation (see, e.g., Carrier 2008 and Kent 2011). However, no systematic ex post-analysis exists in regard to the extent of the correct identification of mergers with innovation effects. In our empirical study, we could only contribute indirectly to this issue: We showed econometrically that the probability that the agencies challenge mergers with innovation concerns increases with the innovation intensity of the industries of the merging firms.³⁰ The fact that the agencies focussed more on innovation in innovative industries provides at least some confidence that the agencies considered innovation where it is particularly relevant.

3.3 Market Definition: Did the Antitrust Agencies Use an Innovation-specific Approach?

The next question is how the agencies assessed whether it can be expected that the mergers might lead to negative effects on innovation. In section 2.3, we saw that the main discussion in the literature focused on the problem whether traditional approaches as the product market approach are also sufficient for dealing with innovation effects or whether a more innovation-specific approach might be necessary. In our study we did not ask directly whether and/or to what extent the antitrust authorities have applied the innovation market analysis. Instead we asked whether the agencies used an innovation-specific investigation approach that differs significantly from the traditional product market approach. As a crucial criterion for distinguishing a new innovation-specific approach from the traditional product

³⁰ See Kern/Dewenter/Kerber (2014, 8-10); see also Gilbert (2008a) and Park/ Sonenshine (2012).

market approach we asked whether the agencies considered already innovation in the market definition or only in the competitive effects analysis.

Therefore, in our empirical analysis (see Table 1) we investigated whether innovation was mentioned explicitly in the market definition and in the competitive assessment part of the "complaints". Taking the criterion "innovation in market definition" as crucial distinction feature leads us to two different approaches that have been applied by the agencies: In the first traditional approach an agency used the wording "manufacturing and sale of ..." without referring to innovation or R&D, and claimed negative innovation effects only in the competitive assessment analysis.³¹ In the second innovation-specific approach, the agencies used innovation already in the market definition, e.g. as "research, development, manufacturing and sale of ...", and afterwards claimed either (a) explicitly negative innovation effects or (b) only implicitly innovation effects by claiming generally anticompetitive effects in regard to a market, whose definition also included innovation.³²

It is a surprising result of our study that, overall, in 69% of all markets, in which the agencies claimed innovation concerns, innovation can already be found in the market definition. Additionally, this share increased from 65% to 82% from the first (1995-2003) to the second sub-period (2004-2008), and this rise is also statistically significant (Kern/Dewenter/Kerber 2014, 16). A closer look, however, reveals significant differences between the two agencies DOJ and FTC. Whereas the DOJ used innovation in the market definition in only 41% of all markets (with no differences between both sub-periods), the FTC used innovation on average twice as often (82%), and with a clear increase from the first (78%) to the second sub-period (95%). This implies that the FTC has used innovation in the market definition nearly always between 2004 and 2008. This also statistically significant difference in the use of innovation in the market definition between both agencies shows that despite considering innovation effects to a similar extent, their approach for assessing innovation effects differed considerably. This is also confirmed by the different extent of the use of innovation in the competitive effects analysis: Whereas the DOJ mentioned in this part nearly always innovation effects explicitly (99%), the FTC did this to a much lesser degree, and with a further decrease from the first to the second sub-period (from 76% in 1995-2003 to only 50% in 2004-2008). Since at the FTC this decrease is entirely compatible with the increase of innovation in the market definition, these developments indicate that these different approaches of both agencies have become to some extent more consistent and accentuated over time. However, it is also important to note that despite these clear differences, both agencies used to

³¹ DOJ: e.g. *United States v. Cookson Group PLC, et al.*, 1:08CV00389; *United States and Plaintiff States v. Oracle Corporation*; *United States v. Computer Associates International, Inc. and Platinum Technology International, Inc.*, 1:99CV01318; *U.S. v. MICROSOFT CORPORATION (INTUIT, INC.)*). FTC: e.g. *Solvay & Ausimont*, Docket No. C-4046; *Tyco & Mallinckrodt*, Docket No. C-3985; *Zeneca & Astra* Docket No., C-3880.

³² a) DOJ: e.g. *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998). FTC: e.g. *Amgen & Immunex*, Docket No. C-4056; *Glaxo Wellcome & Smith Kline Beecham*, Docket No. C-3990; *INA Holding Schaeffler & FAG Kugelfischer*, Docket No. C-4033; *Lockheed Martin & Loral*, Docket No. C-3685. b) DOJ: *United States v. Raytheon, General Motors, and HE Holdings*, 1:97CV02397. FTC: e.g. *American Home Products & Solvay*, Docket No. C-3740; *Baxter & Immuno*, Docket No. C-3726; *Raytheon & Chrysler*, Docket No. C-3681.

some extent both approaches, i.e. also the FTC used the traditional product market approach, and the DOJ the more innovation-specific approach in regard to market definition in a minority of their cases.

In a recent, at first sight, very critical article of Kent (2011) about the use of innovation markets in U.S. merger policy, it was alleged that the agencies did not analyze sufficiently whether there were "specialized assets". In the innovation market approach (as well as in the IP Antitrust Guidelines, DOJ/FTC 1995), it was emphasized that for the definition of innovation markets it is also necessary that specialized assets can be identified, which are necessary for innovation and whose absence would hinder other firms to innovate in this particular field. Otherwise, negative effects of mergers on innovation cannot be reliably expected and no innovation markets should be defined (Gilbert/Sunshine 1995, 596). From an innovation economics perspective, this criterion can be linked to the resource-based theory of the firm, which views the knowledge base of a firm as its most critical resource for achieving a competitive advantage.³³ From that perspective, specialized assets, which are indispensable for innovation, can be seen as a barrier to entry for innovation competition. Therefore, the question is important, to what extent the agencies investigated whether specialized assets can be identified. This can be viewed as part of the question for an innovation-specific approach to market definition.

In our study, we regarded all resources as specialized assets, which are indispensable for research and development and which are difficult to acquire and adopt in an adequate period of time (e.g. intellectual property rights, experience, know-how, etc.). We distinguished them from other (less innovation-specific) entry barriers as, e.g., high sunk costs, manufacturing capabilities, service and sales networks. In a second step we differentiated within the innovation-specific specialized assets between intellectual property rights (patents, copyrights etc.) on one hand and knowledge-based resources as experience, know-how, qualification etc. on the other hand. A first important result (see Table 1) is that in most cases both innovation-specific entry barriers (intellectual property rights, know-how and experience) and other (more conventional) entry barriers were claimed as important by the agencies. Traditional entry barriers were claimed in 84% of all relevant markets. Since overall in only 30% of all markets innovation-specific entry barriers as intellectual property rights, know-how, and experience were not mentioned by the agencies, the question of necessary specialized assets for research and development was addressed in regard to 70% of all markets with innovation concerns. It is also an interesting result that non-intellectual property knowledge resources (in 60% of all markets) were seen more often as a critical asset than intellectual property rights (in only 19% of all markets). More importantly, the descriptive statistics seem to suggest that the importance of these innovation-specific entry barriers increased over time. In the period 2004-2008, the DOJ and FTC saw know-how and experience (intellectual property rights) in 74% (36%) of all markets as a specialized asset. Although our analysis cannot assess how seriously the agencies investigated the question of necessary specialized assets, these results show clearly that both agencies considered this criterion in most cases. It also gives

³³ See, generally, Barney (1991), Newbert (2007), and Kern/Ackermann (2014).

some support to our thesis of an increasing relevance of an innovation-specific assessment approach for the review of mergers.³⁴

3.4 Competitive Assessment

3.4.1 Firm Concentration

Identifying the relevant competitors through market definition is always only the first step in any merger assessment. In section 2, we provided an overview about our insights from theoretical and empirical research about innovation effects of mergers, and the discussion about relevant assessment criteria. Usually the first criterion in the competitive assessment part is concentration measures, which at least serves as a sorting criterion for deciding between unproblematic and more problematic mergers that warrant a deeper analysis. Since traditional measures as market shares and Herfindahl-Hirschman-Index (HHI) might not be very relevant (or even not computable) in regard to innovation concerns, the pure number of independent innovating entities is often seen as a more innovation-specific measure for the relevant concentration.³⁵ In regard to concentration measures our study shows that the agencies used both the conventional concentration measures market shares and HHI (50% of all markets) and the number of firms (38%; see Table 1). The use of both types of quantitative measures increases over time, whereas the use of vague non-quantitative statements about concentration (as, e.g., "highly concentrated"³⁶), which had been used particularly often in FTC cases in the first sub-period, has declined over time. In regard to the more innovation-specific measure "number of firms", it is interesting that our econometric study suggests that, firstly, the application of this measure significantly increased from the first to the second sub-period (to overall 51%; however, mainly through an increase at the FTC), but, secondly, it was surprising that overall the DOJ used the number of firms significantly more often than the FTC. The considerable share of markets, however, in which also the conventional measures were used, is not surprising, because the agencies - as we will see below in section 3.4.4 - often also claimed price effects at the same markets. Overall, the broad and increasing use of the measure "number of firms" as a relevant concentration measure for assessing innovation effects of mergers clearly supports the view that both agencies used in that respect also an innovation-specific approach.

³⁴ However, the descriptive statistics show that both agencies also used more traditional entry barriers in addition to the innovation-specific ones.

³⁵ This is also the reason why in the Antitrust Guidelines for the Licensing of Intellectual Property (DOJ/FTC 1995) the safe harbour solution of at least four other independent firms is defined with the number of firms, and not with market shares.

³⁶ See, e.g., "[...] highly concentrated" (see, e.g., American Home Products & Cyanamid, Docket No. C-3557; Sensormatic & Knogo, Docket No. C-3572; The Boeing Company, File No. 001 0092, Docket No. C-3992); "highly concentrated [...] Respondents are the two leading suppliers" (see, e.g., General Electric & Invision, Docket No. C-4119); "[...] two of a very small number of competitors" (see, e.g., Raytheon & Chrysler, Docket No. C-3681); "[...] the two largest suppliers in the US" (see, e.g., Itron, Inc. & Schlumberger Electricity, Inc., Docket No. C-4114); "[...] two of the leading suppliers in the world" (see, e.g., Svedala Industri AB/Metso Oyj Corp., FTC File No. 001-0186, Docket No. C-4024).

How high were the post-merger concentration levels in all those markets where the agencies claimed innovation concerns? Since in 81 markets the agencies gave only inconcrete, non-quantitative information about concentration, we limited our analysis to the 242 markets, in which the agencies provided quantitative ex-post merger concentration measures (HHIs, market shares, or the number of competitors). Since nearly all of the markets were highly concentrated according to the definition of both the old and new Horizontal Market Guidelines, we used a different classification with finer distinctions within the large range of highly concentrated markets (see Table 1). We defined three classes: markets with very high concentration ($\text{HHI} \geq 5000$, market shares $\geq 70\%$, or a post-merger number of competitors ≤ 2 , i.e. that the mergers lead to a duopoly or monopoly), markets with high concentration ($3000 \leq \text{HHI} < 5000$, $45\% \leq \text{market share} < 70\%$; $3 \leq \text{number of competitors} \leq 4$), and markets with low and medium concentration ($\text{HHI} < 3000$, market shares $< 45\%$, number of competitors > 4).³⁷ The most important result of our analysis is that in nearly two thirds of all markets with innovation concerns the post-merger concentration level is in the class of very high concentration. Post-merger HHIs of larger than 5000 or 3:2 and 2:1 mergers are examples of such an extremely large concentration. In only 5% of all markets with innovation concerns of the agencies the concentration level was low or medium ($\text{HHI} < 3000$). This result seems to suggest that the agencies do only claim innovation concerns of mergers in the case of high and very high concentration levels. The descriptive statistics also indicate that this is even more so at the DOJ than the FTC, and it might have increased over time.³⁸ Since we will see below that the agencies often claimed both innovation and static price concerns at the same market, we have to discuss these results within a broader context later.

3.4.2 Theories about Innovation Effects of Mergers

The overview about our theoretical and empirical knowledge in regard to innovation effects of mergers (section 2.2) showed that many theoretical models as well as empirical studies with manifold insights exist. However, it also became clear that any investigation into the innovation effects of particular mergers is based upon a much thinner and more disputed scientific evidence than, e.g., price effects. This is particularly true for the question of a clear link between firm concentration on one hand and innovation on the other hand, but also in regard to the mechanisms through which mergers might have an impact on innovation. From that perspective, it is, in a first step, important to ask what kind of specific reasonings the agencies provided, why a merger should have negative effects on innovation. Since the agencies were often not very specific in their reasonings (as we will see in the next section), we differentiated in our empirical study only between two groups of arguments. The first group encompasses reasonings which are based upon various theories and models which argue that a merger might reduce innovation incentives, which might lead either to less investment in R&D and/or a slow-

³⁷ A more precise explanation of the methodology for this classification can be found in the appendix.

³⁸ Since we have not tested this econometrically, we do not know whether this is statistically significant.

ing down of research and development.³⁹ The mechanisms behind these decreasing innovation incentives might be very different (see section 2.2.2), but they are mostly based upon mainstream industrial economics approaches. However, in our analysis of cases, we also found reasonings about negative innovation effects of mergers that were close to evolutionary arguments about possible negative effects on competition as a process of parallel experimentation with different problem solutions through a reduction of parallel R&D projects and/or the number of independent sources of innovation through mergers (diversity arguments).⁴⁰ In our empirical study, we, therefore, analyzed the complaints in respect to the question to what extent the agencies used either innovation incentive or diversity arguments for substantiating why the merger might have negative innovation effects.

In the 323 markets with innovation concerns the agencies used innovation incentive arguments in roughly a third of all markets (105 markets: 32.5%; see Table 1). Although this percentage of markets with innovation incentive arguments increased from the first to the second sub-period (from 29% to 44%), which is also confirmed as statistically significant in the econometric analysis (Kern/Dewenter/Kerber 2014, 23), it is still rather low, if one takes into account that these are the main arguments for innovation effects suggested by both economic theory and the Innovation Market Analysis. Our econometric study also confirmed that there were no significant differences of the use of innovation incentive arguments between both agencies (despite a higher percentage at the DOJ than the FTC; Kern/Dewenter/Kerber 2014, 23). From that perspective, the use of diversity arguments in overall 23 markets (7%) does not seem to be so small. However, the latter arguments have been mainly applied in the first sub-period 1995 to 2003, whereas afterwards they can be found only in single cases.⁴¹

3.4.3 Extent of Reasoning

The most important result of our examination of the theories and reasonings in regard to innovation effects of mergers might be that the agencies in the majority of cases gave no specific reasonings why the mergers might lead to negative effects on innovation. In nearly two thirds of all merger cases with innovation concerns the agencies have not given any specific reasons why the mergers might have negative effects on innovation. Although the numbers in Table 1 seem to indicate that the DOJ has given more reasonings than the FTC and that in both agencies the share of inconcrete reasonings has decreased, in our econometric study we could not confirm these differences as statistically significant

³⁹ See, e.g., *Ciba-Geigy Ltd.*, 123 F.T.C. 842 (1997); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29. 1998); *Eli Lilly & PCS*, Docket No. C-3594; *INA Holding Schaeffler & FAG Kugelfischer*, Docket No. C-4033; *General Electric & Agfa*, Docket No. C-4103; *General Electric & Invision*, Docket No. C-4119; *U.S. v. Northrop Grumman Corp. and TRW Inc.*, 1:02CV02432.

⁴⁰ See, e.g., *United States v. Lockheed Martin Corp.*, Civ. No. 98-00731 (D.D.C. complaint filed March 23, 1998); *United States v. Halliburton Co.*, Civ. No. 98-2340 (D.D.C. complaint filed Sept. 29. 1998); *Glaxo plc*, 119 F.T.C. 815 (1995); *The Upjohn, Co.*, 121 F.T.C. 44 (1996); *Ciba-Geigy Ltd.*, 123 F.T.C. 842 (1997); *Pfizer Inc. and Warner-Lambert Co.*, FTC Dkt. No. C-3957 (June 19, 2000).

⁴¹ The numbers of markets with diversity arguments were too small for carrying out an econometric analysis.

(Kern/Dewenter/Kerber 2014, 24, fn.23). But even in the second sub-period 2004 - 2008, the agencies have claimed in 53% of all markets negative innovation effects without giving any specific reasonings. This result might raise serious concerns about the quality of the assessment of innovation effects or, at least, about the transparency of the agencies in regard to their assessments. It might also be a sign for the still large extent of insecurity and uneasiness of the agencies about this kind of assessment. Another interpretation of the lack of specific reasonings would be that the agencies often use also in regard to innovation effects presumptions about the negative innovation effects of mergers through an increase of firm concentration, which would unburden the agencies to give specific reasons in each case. In section 2.3 we saw that the use of presumptions about the innovation effects of firm concentration has been discussed very critically. We will come back to this question in more detail below.

3.4.4 Simultaneity of Claims of Price and Innovation Effects and the Problem of Presumptions

Antitrust agencies challenge mergers, if the mergers lead to harm for consumers, which can consist of static price effects and/or innovation effects. In most challenged merger cases the agencies have claimed only price effects (264 of all 399 challenged mergers, see Table 1). It is now a very interesting result in our empirical study that the agencies tended to claim simultaneously static price effects when they claim innovation effects. In Table 1, it can be seen that in 84% of all markets in which the agencies claim innovation effects they also allege static price effects. In this respect, we also could ascertain clear differences between the agencies. The DOJ nearly always (99%) has claimed also static price effects, if they have mentioned innovation concerns, whereas the FTC has done this only in 77% of the markets. Additionally, the simultaneity of claims of price and innovation concerns increases from the first to the second sub-period. Both statements have been confirmed by our econometric tests as statistically significant (Kern/Dewenter/Kerber 2014, 24). This far-reaching simultaneity of claims about price and innovation effects of mergers is theoretically a surprising and also puzzling result, because the theoretical explanations how a merger would lead to higher prices and less innovation are very different and independent from each other. Increasing prices through mergers can be explained either through coordinated effects (based upon price collusion theory) or non-coordinated/unilateral effects (based upon non-cooperative game theory in oligopolistic settings). Both mechanisms are very different from the mechanisms of innovation effects of mergers discussed in section 2.2. Therefore, the question emerges whether the agencies have really assessed price and innovation effects independently, or whether they have strategically also claimed additionally static price effects in the cases in which they wanted to allege innovation concerns. Or, vice versa, that they sometimes might not have claimed innovation concerns, if they would not also have good arguments for alleging static price effects.⁴²

However, there might be also another reason for not providing specific reasonings about how a merger might lead to negative innovation effects. One possibility is that the agencies have used ex- or

⁴² This puzzling simultaneity is also confirmed by the fact that in all 135 challenged mergers with innovation concerns, the agencies alleged only in 18 (from overall 341) markets solely price effects without innovation concerns. This is a surprisingly very low number.

implicitly presumptions about negative innovation effects through an increase of firm concentration. In section 2.3, we saw that in the academic discussion general presumptions about innovation effects have been viewed very critically. It is hard to ascertain from the complaints and decision and orders, to what extent the agencies have used presumptions. However, we should keep in mind that the safe harbour solution in the Antitrust IP Guidelines that no negative effects on innovation competition are expected, if there are at least four other independent entities that have the resources to innovate, entails at least a presumption when no negative innovation effects might be expected. Since we have seen that the absolute level of firm concentration (either measured as number of firms or market shares and HHI) in the markets where the mergers were challenged also in regard to innovation concerns were very high, it cannot be excluded that in a much more cautious way as in the IP guidelines the agencies have used implicitly a presumption that mergers with such a very high firm concentration might lead to negative innovation effects. The analysis, however, is still more complicated, because we have seen that the DOJ always and, to an increasing extent, also the FTC claimed simultaneously static price effects and negative innovation effects on the same markets. Therefore, we often cannot distinguish whether a certain decision of challenging the merger was based upon a presumption about the price and/or innovation effects.

3.4.5 Competitive Assessment: A Path to More Cautiousness?

Based upon all these results from our empirical study, we would suggest the following interpretation of the practices of the agencies: Firstly, the fact that the agencies often refrain from giving specific reasonings why a merger should lead to negative innovation effects, shows a large degree of insecurity of the agencies about how innovation effects should be assessed. Secondly, the simultaneity of alleging also price effects if the agencies claim innovation concerns can be interpreted as the result of a strategy of caution, because the price-effect arguments fit much better into the traditional antitrust approach than this new kind of innovation effects argument. Thirdly, this cautious way of taking innovation effects into account (with the safety net of claims about static price effects) also seemed to have increased over time. This is confirmed, on one hand, by the increase of the share of alleged price effects in the second sub-period, but, on the other hand, also by the increase of the use of in mainstream economics much more well-established innovation incentive arguments in comparison to more innovative evolutionary diversity arguments, which practically vanished in the second sub-period. A fourth conclusion refers to differences between both antitrust agencies. Our results here fit in rather well with our previous results in section 3.3 about approaches to market definition. Also here the DoJ was the more traditional, and therefore cautious agency, because it relied not only more on the product market approach but also more on well-established innovation incentive arguments, and they practically always claim also static price effects, if they have innovation concerns. The FTC, on the contrary, also moved over time into this more cautious traditional direction, but it was more innovative in the first sub-period, and even between 2004 and 2008 the FTC had in a number of markets claimed innovation concerns without simultaneously alleging also price effects. Fifthly, we cannot not say much about the question whether the agencies implicitly used presumptions. However, the fact that in nearly all mar-

kets, where the agencies have claimed innovation concerns in challenged merger cases, the level of firm concentration was high or very high, suggests that the agencies were very cautious about using strong presumptions about concluding negative innovation effects from the pure rise of firm concentration through the merger. They might have done so only in cases with very high concentration.

3.5 Decisions, Settlements, and Remedies

What were the outcomes of the challenges of the mergers with innovation concerns? From the 135 challenged mergers with innovation concerns (Table 1), 124 (91.8%) were settled by consent decrees between the merging parties and the agencies. It is particularly remarkable that between 1995 and 2008 only four cases (3.0%) were litigated in court. In two of them the court granted the agency's request for injunctive relief and consequently blocked the merger.⁴³ In the other two cases the court did not follow the agency's motion, i.e., the request for injunctive relief was denied.⁴⁴ All of them were DOJ cases. Not one merger with innovation aspects that was challenged by the FTC was litigated in court.⁴⁵ In another seven cases the DOJ tried to block the transaction, but the parties terminated/abandoned the merger after the complaint was filed in court.⁴⁶ After 2004 not one of the DOJ challenges to mergers with innovation concerns led to a termination through the parties, and the only litigated case was lost in court. Although there are considerable differences between the final outcomes of merger cases at both agencies, we will not discuss them here in more detail, because they can be partly explained by the different proceedings in merger cases at both agencies.

Nearly all cases in our sample of mergers with innovation concerns had been settled by consent decree with structural remedies of different kinds. Since the remedies in a particular settlement were often related to more than one market (as defined in the complaint) or the agencies used rather general terms like "the assets to be invested" leaving the relevant markets unspecified, we had to analyze the remedies on the level of merger cases instead of markets with innovation aspects. The most important remedy were divestitures. They can be found in 101 of all 124 settlements. In 20 settlements licensing of intellectual property rights was used. In only 22 of all settlements other kinds of remedies can be found. The numbers seem to suggest that divestitures have gained importance over time (but we have not tested this econometrically). In the most recent period 2004-2008 both the DOJ and the FTC required divestitures in 80% of the challenged merger cases as the sole remedy in their settlements. For the entire period, only in 19% of the cases the agencies did not order divestitures but relied on other remedies. It is interesting that these were all FTC cases, whereas the DOJ always required

⁴³ Permanent injunction was granted in *U.S. v. Franklin Electric Co., Inc., et al.* (00-C-0334). In *U.S. v. UPM-Kymmene Oyj, Raflatac, Inc., Bemis Company, Inc. & Morgan Adhesives Company* (03-C-2528) the district court granted a preliminary injunction and the parties abandoned the transaction shortly thereafter.

⁴⁴ Injunctive relief was denied in: *U.S. v. Engelhard, Corp. et al.* (6-95-cv-45) and in *U.S. and Plaintiff States v. Oracle Corporation* (C-04-0807).

⁴⁵ To our knowledge, the only case with innovation aspects in which the FTC authorized staff to seek injunctive relief was Cytec's proposed \$429 million acquisition of Digene Corporation. However, the parties abandoned the transaction prior to the Commission's filing of the complaint in district court. Hence, we were unable to analyze the respective complaint and had to exclude this case from our study.

⁴⁶ The parties terminated the transaction in: *U.S. v. Microsoft Corporation*, Complaint (April 27, 1995); *U.S. v. Lockheed Martin Corp. and Northrop Grumman Corp.*, Complaint (March 23, 1998); *U.S. v. Compuware Corp. and Viasoft, Inc.*, Complaint (October 29, 1999); *U.S. v. WorldCom and Sprint Corp.*, Complaint (June 27, 2000); *U.S. v. General Dynamics Corporation and Newport News Shipbuilding Inc.*, Complaint (October 23, 2001); *U.S. and Plaintiff States v. Echostar Communications Corp., et al.*, Complaint (October 31, 2002). In *U.S. v. SGL Carbon Aktiengesellschaft and SGL Carbon LLC.*, Complaint (April 15, 2003), the DOJ dismissed all causes of action in the complaint, because the German company lost its bid in bankruptcy court to acquire Carbide/Graphite Group.

divestitures (partly in combination with other remedies). In comparison to divestitures licensing as an alternative (but perhaps also weaker) means for providing access of other competitors to critical resources plays a significant but limited role for remedying competition problems (in overall 20 settlements), and also a diminishing one (at least as sole remedy). The use of other remedies (e.g., the termination of contracts and agreements or the obligation to provide and disclose information) can be found in overall 22 settlements, but they seem to have declined over time (both in DOJ and FTC cases). Although we could not ascertain in all of these cases, to what extent these remedies were innovation-related, there are a considerable number of settlements, esp. in regard to pharmaceutical mergers (see next subsection 3.6), in which the divestitures and licensing requirements explicitly focussed on the protecting of innovation competition.

3.6 Mergers in the Pharmaceutical Industry: A Special Group of Cases

The merger cases in the pharmaceutical industry are a particularly interesting and distinct group. Firstly, the pharmaceutical industry is a very innovative industry, in which R&D is crucial (at least for originator firms). Secondly, due to the FDA regulations for market approval (with its extensive documentation requirements of the results of preclinical and clinical research) R&D projects for new drugs for certain diseases are well-defined and well-documented. This allows for a much better identification of relevant innovation competitors than in other sectors. Thirdly, due to the FDA regulations and patent protection of the ingredients barriers to entry for new innovating firms are high. Fourthly, during our investigation period a huge consolidation of the global pharmaceutical industry took place, with a large number of mergers leading to many merger reviews in the pharmaceutical industry (Comanor / Scherer 2013). In the U.S., these mergers were assessed exclusively by the FTC, which developed over time a relatively consistent way how to deal with pharmaceutical mergers and solve competition problems through settlements.

From the overall 45 pharmaceutical mergers that the FTC challenged between 1995 and 2008 we could find innovation aspects in 23 merger cases by applying our criterion that innovation was either used in market definition and/or in the competitive effects analysis (leading to overall 63 markets with innovation aspects). To what extent was an innovation-specific approach used in regard to pharmaceutical mergers? In 61 (97 %) of the 63 markets with innovation aspects of the pharmaceutical mergers (43 in period 1 and 20 in period 2), "research and development" was already mentioned in the market definition. 27 of these markets contained innovation aspects in both the market definition and the anticompetitive effects, whereas only two of the 63 markets⁴⁷ were defined without referring to research and development, implying that the negative effects on innovation were exclusively claimed in the competitive effects analysis. The typical procedure was that the FTC did define relevant markets (with or without "research and development") according to products and/or R&D projects for pharmaceutical treatment of particular diseases (or groups of diseases).⁴⁸ In the competitive assessment it

⁴⁷ Both of them (Eli Lilly/PCS and Zeneca/Astra) falling into the earlier period of 1995-2003.

⁴⁸ In 47 of the overall 63 markets with innovation aspects (75%) the FTC simultaneously claimed price effects - in the second period even in 100% of the markets (in 20 out of 20 markets). Diversity arguments were brought forward in 5 markets – all of them in the period before 2004. Incentive aspects

asked for the HHIs, market shares and/or number of actual competitors or other firms with relevant R&D projects.⁴⁹ There are cases in which so far no current product (market) existed, whereas in other cases, one of the merging firms with a current product on the market bought another firm with a competing drug in the pipeline. It is crucial that in many cases the FTC did explicitly claim in the competitive effects analysis that the merger would impede innovation competition.

All 23 challenged merger cases were settled with remedies. Over time, there is a clear shift of the remedies to divestitures. Whereas in the first period (1995-2003) licensing agreements (44%) and other remedies (30%) were still important in comparison to divestitures (75%), in the second period (2004-2008) the settlements relied exclusively on divestitures. The divestitures refer to the R&D projects of one of the merging firms, which have to be sold to another independent competitor. For these divestitures a clear and consistent practice developed, which is entirely compatible with an innovation-specific approach. For the settlements in these cases ("decision and orders") the FTC developed a very detailed procedure (with a lot of precisely defined obligations of the merging firms) to ensure that the success of this divested R&D project cannot be compromised by any current or later action of the merging firms. This required the very precise identification and definition of all relevant assets (physical assets, human resources, intellectual property rights etc.), which are necessary for carrying out the R&D project. Crucial is (1) that the FTC intended with these structural remedies to maintain explicitly innovation competition and an additional independent competitor, and (2) that the remedy focussed entirely on the necessary specialized assets for innovation, which is exactly what would follow from an "innovation market" approach.

Our objective in this article is not to analyze whether the FTC was right to challenge these pharmaceutical mergers but to investigate their assessment approach. Important other studies of a group of (especially important) pharmaceutical merger cases, which are a subgroup of our sample, are Carrier (2008) and Kent (2011). Both analyze whether the FTC decisions to challenge were justified. For example, Carrier (2008) came to the conclusion that in five of nine cases the FTC came to the correct decision, but that in four merger cases (Roche/Genentech, AHP/Cyanamid, Ciba-Geigy/Sandoz, Pfizer/Warner-Lambert) the FTC should not have challenged the mergers. Kent (2011) is even more critical. However, more important for our purpose is that their main objective is a critical examination of the "innovation market" approach. Both authors seem to be on the opposite ends of the discussion, with Carrier as the most prominent current supporter of the innovation market concept and Kent as a seemingly fierce opponent to this concept. However, both agree that the specific characteristics of R&D processes in the pharmaceutical industry should be taken more into account. This refers primarily to the problem whether R&D projects in early (preclinical) stages (with its well-researched small probabilities of success) should be considered at all in the merger reviews. Therefore Carrier (2008) proposed a specific and distinct (five-step) assessment scheme for pharmaceutical mergers, which ex-

were provided in 15 markets – again, all of them in the first period. In 47 of the overall 63 markets the FTC did either not include innovation in the competitive effects analysis (only in the market definition) or remained inconcrete – with respect to the second period even in 20 out of 20 markets.

⁴⁹ In 18 out of overall 63 markets the FTC relied on HHIs (15 in period 1 and 3 in period 2), in 23 on market shares (11 in period 1 and 12 in period 2) and in 33 on the number of significant competitors (23 in period 1 and 10 in period 2).

cludes all R&D projects in preclinical phases (due to its small success rates) and would include also the specific stage of the projects as an important part of the competitive analysis. This is also the main reason why he would not have challenged some of the mergers. Important for our discussion is that both the practice of the FTC of developing a specific approach how to deal with pharmaceutical mergers as well as the specific proposal of Carrier (2008) for mergers in the pharmaceutical industry point into the same direction: Searching for sector-specific assessment approaches for innovation effects of mergers, which are better capable of taking into account the specific realities of innovation in particular industries.

3.7 The Assessment of Innovation Effects in Merger Policy until 2008: A Synopsis

The overall assessment of the extent and how the U.S. agencies assessed innovation effects of mergers ends up in a rather mixed and very ambivalent result. Our (a longer period entailing) empirical study confirms the earlier claims of Gilbert (2008a) that innovation concerns have been regularly assessed in a significant share of all challenged mergers. Even after the decision of the FTC not to challenge the Genzyme/Novazyme merger in 2004 as the so far only pure innovation merger case, which was claimed as a possible turning-point against the innovation market approach,⁵⁰ the agencies did not seem to have diminished their efforts in regard to possible innovation concerns of mergers. We could also verify that the probability that a merger is challenged with innovation concerns increases with the innovation intensity of the respective industries. Therefore, despite all critique about the innovation market concept the assessment of innovation effects has become an established part of the regular assessment procedures of the agencies in merger reviews in the period up to 2008. It is interesting that there seem to be also no differences between the DOJ and the FTC in that respect. The record of the challenged cases in this period also shows that in a considerable number of settlements remedies were imposed that aim directly at innovation concerns and the maintaining of innovation competition. In regard to pharmaceutical merger cases, the requirement of divestitures of R&D projects (and all the necessary specialized assets), if the merger might lead to a (too large) reduction of parallel research paths in innovation competition, has also become a regular practice in this sector.

However, neither our quantitative nor the other qualitative studies of the merger cases can support the thesis that the agencies succeeded in developing a clear and consistent approach during this period how innovation effects should be assessed. Especially in regard to the crucial question whether a traditional assessment approach based upon product markets or a more innovation-specific approach should be used, the case practice of the agencies showed a remarkable degree of variation, both between the agencies but also within the agencies. In most cases with innovation concerns the DOJ did not mention innovation in the market definition, but used the product market concept, and referred to possible negative innovation effects of the mergers only in the competitive effects analysis. But in many cases the DOJ also used the much more innovation-specific approach predominantly used by

⁵⁰ In that respect, the opinion of FTC Commissioner Rosch (2009) about a change in regard to the application of the "innovation market" concept after the Genzyme/ Novazyme case did at least not affect the question whether the agencies took innovation effects into account.

the FTC, which already included research and development as relevant parameters of competition in the market definition, and then asked whether the merger might have negative effects on this competition. Based upon these differences in regard to market definition, it is not surprising that the DOJ nearly always claimed explicitly innovation effects in the competitive effects analysis in contrast to the FTC. Although these differences in regard to market definition between the agencies could be confirmed as statistically significant, other aspects about a more innovation-specific or traditional assessment approach proved as being less clear. For example, the more innovation-specific measure of the number of firms as concentration measure in contrast to traditional measures as HHI or market shares was used by both agencies. Both agencies also used to a similar extent more innovation-specific resource-oriented barriers to entry.

It seems to be particularly problematic that, in most cases, the agencies provided no specific reasoning why the mergers should lead to negative effects on innovation. Although most of the theoretical literature focusses on the negative effects on innovation through potentially lower innovation incentives, reasonings about innovation incentives are mentioned only in a minority of markets with innovation concerns. Other reasonings which are closer to evolutionary diversity arguments even seemed to practically vanish in the second sub-period 2004-2008. Although the use of innovation incentive arguments has increased over time, esp. at the DOJ, the lack of providing specific arguments about the negative innovation effects in most of these markets raises serious questions about the depth of the investigation, the uncertainty of the agencies or the transparency of their deliberations. Overall, our results support the view that the agencies got more cautious over time, in particular, if we take into account that they increasingly claimed simultaneously innovation and price effects.

4. Innovation Effects of Mergers: Recent Discussions and Research Perspectives

4.1 U.S. Merger Policy under the Obama Administration

Since our empirical study included merger cases only until 2008, we have, in the meantime, five years more experience with merger cases. These additional five years simultaneously coincide with the tenure of the Obama Administration, which took office in January 2009. At the same time, there was already a broad discussion between the U.S. antitrust agencies, lawyers, and the academia about the reform of the Horizontal Merger Guidelines (DOJ/FTC 1992), which led to the publication of new Guidelines in 2010 (DOJ/FTC 2010). In this section, we will briefly discuss, in a first step, to what extent the innovation assessment of mergers has changed in the last 5 years after 2008. In contrast to our econometric study for the cases before 2009, we can do this only in a more traditional, qualitative form by looking at several important cases in this period. In a second step, we will analyze the general recent discussion about assessing innovation effects of mergers in the context of the reform of the Horizontal Merger Guidelines. We will see that both in regard to the practice of the U.S. agencies and to the policy discussions about the assessment of innovation effects of mergers, no genuinely new developments have happened in the last five years. This disappointing result will be the starting-point

for our last section 4.2, in which we want to sketch some ideas about new research perspectives how competition authorities should deal with innovation effects of mergers.

At the beginning of the Obama Administration, there was a broad discussion whether there would be a more active application of antitrust laws by the new administration, and what kind of changes might be expected (Harty 2010). The newly appointed officials at the Antitrust Division also raised expectations by promising a reinvigoration of antitrust policy in the U.S. After several years of antitrust under Obama, the opinions about such a development are very mixed. There seem to be some consensus that neither the fears in regard to more antitrust intervention nor the partly far-reaching hopes for a more active protection of competition through antitrust application were justified by the ensuing practice of the agencies. Whereas, e.g., Baker/Shapiro (2012) have claimed that the antitrust policy in the first term of Obama was more active than under the Bush administration, other scholars are much more skeptical about such a claim, and emphasize much more the continuity of antitrust application (Crane 2012a, 2012b). One of the offered reasons is that, in the meantime, the application of antitrust laws is done according to certain well-established technical standards, which lead to less political influences in regard to antitrust policy (Crane 2012a, Kovacic 2009). This can also be linked to the argument that, in the U.S. system, politically motivated changes in antitrust policy are difficult, because the agencies have to convince the (often conservative) courts. Whether some "reinvigoration" can or cannot be observed, is open to debate, but a very broad majority of antitrust scholars seem to agree that there has been no serious change in antitrust policy, neither generally nor in specific realms, in the last years.

Is this also true for the assessment of innovation effects of mergers? In the following, we summarize briefly our analysis of four merger cases: Pfizer/Wyeth, Merck/Schering-Plough, Thoratec/Heartware, and AT&T/T-Mobile. The first two were very large pharmaceutical mergers, which were allowed by the FTC through settlements. In Pfizer/Wyeth⁵¹ the FTC explicitly defined 20 different product markets ("manufacture and sale") in the field of animal health products, described the market structure by using mostly HHIs and market shares, and claimed generally for all these markets in the competitive effects analysis (in addition to a number of other competition problems, i.e. unilateral and coordinated effects, higher prices) that the "merged entity's incentives to pursue further innovation" would be reduced in all these markets (ibid., 8). This is a typical application of the traditional product market concept with the claiming of innovation incentive effects in the competitive effects analysis. The divestiture in the settlement focusses very clearly on the necessary specialized assets ("animal health products assets") with the explicit objective "to ensure the continued use of such assets in the research, development and manufacturing of each of the Animal Health Products and/or Animal Health Pipeline Products ..." as well as "to create a viable and effective [independent] competitor [...] in the research, development and manufacture ... " [of these products].⁵² This can be found in the same way in the "complaint" and "decision and order" in the Merck/Schering-Plough case.⁵³ The Thoratec/Heartware pharmaceutical

⁵¹ Pfizer/Wyeth, Complaint, Docket C-4267; for a discussion of the Pfizer/Wyeth and Merck/Schering-Plough case, see Kent (2011) and Comanor/Scherer (2013).

⁵² Pfizer/Wyeth, Decision and Order, 8.

⁵³ Merck/Schering-Plough, Complaint, Docket C-4268.

merger case was different. Here the problem was that Thoratec was a monopolist in the "LVAD" market, which is "a life-sustaining technology for treating end-stage heart failure patients",⁵⁴ and Heartware had a competing, possibly superior product ("HVAD") in the later stages of clinical trials threatening the monopoly of Thoratec. This is a clear case of a monopolist buying a firm threatening its monopoly position. After the complaint Thoratec abandoned the merger. Also here the FTC defined product markets and explicitly alleged that the merger would eliminate innovation competition.

A very much discussed case in the mobile telecommunication industry was AT&T/T-Mobile.⁵⁵ It is interesting that in this case also innovation played a large role, but in a very different way than in most other cases. In the U.S. market for mobile wireless telecommunication services there were four national providers with AT&T and Verizon as the market leaders, and Sprint as the next largest competitors and T-Mobile as the smallest firm. According to the DOJ, T-Mobile improved its competitive disadvantage as the smallest provider in an industry with considerable network economies by embarking on a strategy of aggressive pricing and innovation. It developed aggressive pricing plans with lower rates than offered by AT&T and Verizon, and in a number of instances, T-Mobile was the first in introducing innovations (as, e.g., advanced HSPA+ technology, national Wi-Fi 'hot spot' access, Android handset, and different unlimited service plans) in the U.S. wireless industry and the network development. The DOJ concluded that the merger would "eliminate the important price, quality, product variety, and innovation competition that an independent T-Mobile brings to the marketplace" (*ibid.*, 15). Although innovation is emphasized in this case, it is not about research and development but primarily about the introduction of new innovations, which is expected to be slowed down through the merger. The DOJ explicitly viewed T-Mobile as a "disruptive force" in this highly concentrated market, without which there would be higher prices and slower introduction of new innovations.⁵⁶ Here innovation in form of new services and the investment in new (but already known) technology is deeply intertwined with price competition, and can also not be protected by IPRs. Although the DOJ defined product markets, they included in their "hypothetical monopoly" test not only the question for a profitable price increase but also for a profitable reduction in innovation (*ibid.*, 7). Therefore innovation was included both in the market definition and in the competitive effects analysis. After the complaint the merger was abandoned.⁵⁷

Since we have not analyzed all cases since 2009, we have to be very careful with our conclusions. These examples do not contradict that the FTC and DOJ have changed their policies in regard to the extent of considering innovation effects, and in regard to the policy to use divestitures of necessary specialized assets for R&D for solving problems of innovation competition. However, it is very remarkable that in all three of the pharmaceutical mergers the FTC used clearly the product market concept and only included the analysis of innovation effects in the competitive assessment part of the complaint. This raises the question whether after 2008 there was a shift away from the innovation-specific

⁵⁴ Thoratec/Heartware, Complaint, Docket C-9339; see also Shapiro (2012, 398).

⁵⁵ AT&T/T-Mobile, Complaint, No. 1-11-cv-1569 (filed Aug. 31, 2011).

⁵⁶ This resembles an argument about an "elimination of a maverick firm" through the merger.

⁵⁷ For a broad discussion of the AT&T/T-Mobile merger case see AAI (2011), Stucke/Grunes (2012) and Besen et al. (2012).

approach primarily used by the FTC until 2008, especially in the pharmaceutical industry (see sections 3.3 and 3.6), and therefore a shift back to the traditional product market approach.⁵⁸ However, an extension of our empirical study to the cases after 2008 would be necessary forgetting empirical evidence for these claims. In the following section we will look whether such a view would fit to the recent U.S. antitrust discussion about innovation effects of mergers.

4.2 Discussions of the Assessment of Innovation Effects in the Context of the Horizontal Merger Guidelines Reform

The broad discussion about the reform of the Horizontal Merger Guidelines (HMG) is particularly well suited for analyzing the current state of the debate of assessing innovation effects of mergers. First, an important part of the discussion about guidelines is the question whether certain practices of the competition authorities applied in past cases are already accepted well enough to put them down into rules which give guidance for future merger reviews. Secondly, in the discussion of the U.S. guidelines very different groups participated, as, e.g., not only antitrust economists and lawyers in the academia but also law practitioners at law firms, the antitrust authorities themselves as well as policy-makers. Therefore, the sources that can be used for summarizing this debate are very broad.⁵⁹ In regard to our paper, this discussion refers both back to our theoretical discussion in sections 2.2 and 2.3 in regard to our knowledge about innovation effects of mergers, and how antitrust authorities should deal with it in merger policy, as well as to our empirical analysis of the practices of the U.S. agencies in their merger reviews until 2008. The following paragraphs will provide for a brief summary of the most important arguments and opinions in this discussion.

Generally in the discussion, there was a very broad agreement about the great importance of innovation as part of market competition in terms of new products and cost-saving process innovations for the increase of wealth. Manifold concerns were articulated in regard to the danger that an over-emphasis on price effects of mergers in the application of antitrust laws might hamper the innovation process. These concerns have come from very different angles: One important argument emphasizes the importance of innovation efficiencies worrying that short-term static price concerns might lead to the blocking of mergers that would spur innovation through various kinds of innovation-related efficiencies (e.g., AMC 2007, 56-60). From a very different perspective, scholars are concerned that the emphasis on short-term price effects leads to a tendency to overlook the potentially more dangerous long-term negative effects of mergers on innovation. It is also generally accepted that innovation effects might be much more important than short-term price effects, at least in innovation-intensive in-

⁵⁸ For example, Kent (2011) applauds the rejection of the "innovation market" approach in Pfizer/Wyeth.

⁵⁹ See the report of the antitrust authorities DOJ/FTC (2006) about the Horizontal Merger Guidelines, the report of the Antitrust Modernization Commission (AMC 2007), the transcripts of the workshops in the Horizontal Merger Guidelines Review Project on December, 3 and 8, 2009 (FTC 2009a, 2009b), as well as Carlton (2007, 2010), Gilbert/Rubinfeld (2010), AAI (2010), Hylton (2011), Hovenkamp (2011), Evans/Hylton (2008), Katz/Shelanski (2007a), Baker (2008), Sidak/Teece (2009), Rosch (2009, 2010), Shapiro (2010, 2012), Kent (2011), and Feng (2012).

dustries. The opinions are more divided on the question whether antitrust law should and can protect innovation competition through merger reviews. It is certainly only a small minority that thinks that we know so little about innovation processes and/or that innovation can come from such diverse sources (as Schumpeterian competition) that we can and/or need not protect innovation competition through merger reviews.⁶⁰ However, the concerns of this minority that the antitrust authorities might hamper innovation more than foster it by actively attempting to intervene into mergers in order to protect innovation competition, is acknowledged by most of the participants in the debate and the main reason for recommending a cautious (or very cautious) approach. But this does not lead to the conclusion for most of the scholars that the overall practice of the U.S. agencies in regard to the consideration of innovation concerns in their merger reviews since mid of the 1990s was generally wrong or over-ambitious. Therefore, there was a broad support that the assessment of innovation concerns should be integrated more into the new Horizontal Merger Guidelines. However, much more controversial was the question how this should be done.

Let us now first analyze the guidance given by the new Horizontal Merger Guidelines in regard to the assessment of innovation effects, and ask how well these guidelines reflect, on one hand, the practice of the antitrust agencies in their merger reviews, and, on the other hand, the more specific U.S. discussion about the reform of the guidelines in that respect. The first crucial question is about market definition and the question to what extent the innovation-specific approach that we came across in our empirical study has found its way into the new Horizontal Merger Guidelines. Although we have seen that overall the agencies have used innovation in the market definitions of the challenged mergers in about 70% of all markets with innovation concerns (FTC: 95%, DOJ: 41%), neither "innovation" nor "innovation markets" are mentioned once in the long chapter about market definition in the new guidelines. The entire market definition chapter is focussed only on the current products of the firms, i.e. the traditional product market approach with the usual hypothetical monopoly test. Innovation effects of mergers are addressed in two parts of the guidelines, firstly, in the section about efficiencies, where merger-specific efficiencies in regard to the innovation itself or for a better appropriation of innovation benefits are mentioned (balanced with some skepticism about the consideration of alleged cost-saving efficiencies in regard to R&D) (DOJ/ FTC 2010, 31). Secondly, negative innovation effects are addressed as part of the unilateral effects analysis of mergers in the competitive assessment part (see below). Therefore, the new guidelines are very clearly using exclusively the traditional concept of assessing innovation effects by first defining product markets and only considering innovation effects in the competitive assessment analysis. In our empirical study, we saw that this was the predominant concept used by the DOJ, although it also used in many cases a more innovation-specific concept. It is very surprising that there is such a huge gap between the practice of the agencies, esp. the FTC, until 2008 and the new Horizontal Merger Guidelines.

What can be found about the assessment of possible negative innovation effects of mergers in the guidelines? They are dealt with in an own subsection 6.4 about "Innovation and Product Variety" (DOJ/FTC 2010, 23-24). The effects of mergers on product variety imply effects on the extent of prod-

⁶⁰ For arguments against this view, see Katz/Shelanski (2007a), Carrier (2008), Sidak/Teece (2009), and Shapiro (2012).

uct differentiation that consumers are offered in the market, with the well-known trade-off between cost advantages of fewer products and a better fulfillment of heterogeneous preferences through a higher degree of product differentiation. This is one dimension of non-price competition, but it is a matter of static product differentiation and not one of innovation.⁶¹ Therefore, for the question of the assessment of negative innovation effects of mergers, only the first three paragraphs are relevant (DOJ/FTC 2010, 23):

"Competition often spurs firms to innovate. The Agencies may consider whether a merger is likely to diminish innovation competition by encouraging the merged firm to curtail its innovative efforts below the level that would prevail in the absence of the merger. That curtailment of innovation could take the form of reduced incentive to continue with an existing product-development effort or reduced incentive to initiate development of new products.

The first of these effects is most likely to occur if at least one of the merging firms is engaging in efforts to introduce new products that would capture substantial revenues from the other merging firm. The second, longer-run effect is most likely to occur if at least one of the merging firms has capabilities that are likely to lead it to develop new products in the future that would capture substantial revenues from the other merging firm. The Agencies therefore also consider whether a merger will diminish innovation competition by combining two of a very small number of firms with the strongest capabilities to successfully innovate in a specific direction.

The Agencies evaluate the extent to which successful innovation by one merging firm is likely to take sales from the other, and the extent to which post-merger incentives for future innovation will be lower than those that would prevail in the absence of the merger. The Agencies also consider whether the merger is likely to enable innovation that would not otherwise take place, by bringing together complementary capabilities that cannot be otherwise combined or for some other merger-specific reason. See Section 10."

An analysis of these brief paragraphs leads to the following conclusions: The main argumentation is about the reduction of innovation incentives, either for continuing an already existing R&D project or starting a new one. However, it is mostly about potential competition in an already existing product market. The first effect, in which products in the pipeline of one of the merging firms would threaten the revenue from already existing products of the other merging firm, is in that respect not very different from the second "longer-run effect" about reduced incentives to start a new R&D project that might diminish the sale of current products of the other merging firm.⁶² Much more in line with an innovation-specific assessment approach would be the following statement that the agencies "consider whether a merger will diminish innovation competition by combining two of a small number of firms with the strongest capabilities to successfully innovate" (ibid.). Here "innovation capabilities" are mentioned, but there is no hint, how the agencies should identify them. There is no reference to "specialized assets" as, e.g., intellectual property rights, laboratories, know-how or experience. The more innovation-specific concentration measure "number of firms" is used (and not the HHI or market shares), but it certainly remains unclear what a "very small number of firms" means (except the necessity of very high concentration). The problem, however, is that this sentence refers explicitly to the previous ones about the effects of innovation on the revenues of the other merging firm on an already existing product market, and, therefore, has to be read as a potential competition argument. The same is true for the following sentence, emphasizing again the threats to the sales of the other merging firm.

⁶¹ Despite the use of the term product "variety", this also has nothing to do with the discussion about the benefits of "diversity" in regard to the benefits of having several sources of innovation or parallel research projects from an evolutionary economics perspective. For economic models about the product variety problem in competition policy, see, e.g., Motta (2004, 331-333).

⁶² For a deeper explanation using also the term "innovation diversion rates", see Shapiro (2012, 391-394).

Overall, this text is unclear and inconsistent. Except this straightforward case of limiting the negative effects on potential competition on already existing markets, the guidelines give no clear guidance about the assessment of innovation competition. Not even the well-known group of cases is clearly covered, in which the firms compete with R&D projects for the development of a new product, which then would constitute a new product market (future market). There is no hint in regard to the protection of innovation competition between parallel research projects nor for protecting a diversity of sources of innovation. Since the Guidelines recommend only the traditional product market definition, it remains unclear how the agencies would deal with the problem that the incumbent firms on the product market might not be identical with the firms that compete in regard to innovation. All the other references to innovation in the Guidelines mention possibilities how innovation arguments can be used for defending the merger.⁶³ Overall, the guidelines remain far behind the practice in the merger reviews of the U.S. agencies. Especially, the lacking guidance in regard to identify the relevant competitors in innovation competition, the missing analysis of necessary specialized assets as barriers to enter innovation competition, the lack of any specific hint how to assess whether the merger between two of a very small number of competitors would diminish innovation competition (or whether the agencies would use a presumption for that), and the lack of talking about appropriate remedies (e.g., divestitures), as they have been well-established in the pharmaceutical merger cases, show that the guidelines do not reflect the already well-established practice of the antitrust agencies (as shown in our empirical study in section 3). Therefore, we come to the conclusion that the new guidelines neither give clear and consistent guidance how innovation competition should be assessed and protected in merger reviews nor reflects the already wide-spread use of innovation-specific assessment approaches in the merger reviews of the U.S. agencies in the fifteen years before the reform.

Do the guidelines correspond to the more specific Horizontal Merger Guidelines review discussion about the assessment of innovation effects? It certainly echoes the still very strong skepticism and opposition against the innovation market concept in the reform discussion,⁶⁴ although there were also exceptions (as Pitofsky in FTC 2009a, 17).⁶⁵ Even prominent proponents of an active merger policy for protecting innovation competition as, e.g., Katz/Shelanski (2007a) and Gilbert/Rubinfeld (2010), were reluctant in recommending actively the "innovation market" concept. In their analysis of the market definition problem in regard to innovation competition, Katz/Shelanski (2007a, 41-43) develop a position that is very close to the "innovation market" concept, however, without endorsing it explicitly. Also Gilbert/Rubinfeld (2010) in their comment on the draft version of the guidelines make allusions to

⁶³ See the last sentence in the quoted text, the other innovation efficiency arguments in section 10 of the Guidelines (DOJ/FTC 2010, 30), and the mentioning of the argument that positive effects from innovation competition might balance short-term price effects (DOJ/FTC 2010, 20).

⁶⁴ See, e.g., AMC (2007), Carlton (2007), Muris and Melamed in FTC (2009a), Salinger in FTC (2009b), and others who are generally concerned about overenforcement in regard to innovation as, e.g., Hylton (2011). Even the DOJ and FTC in their 2006 report on Horizontal Merger Guidelines (DJC/FTC 2006) did not address the topic of innovation markets, although they mention cases where they used innovation markets.

⁶⁵ An active supporter is also Carrier (2008), who in his article not only defends the innovation market approach by using the theoretical and empirical results of innovation economics, but also develops an own specific version of the innovation market analysis for mergers in the pharmaceutical industry. More radical in breaking with the traditional approach is Sidak/Teece (2009, 615-619).

the innovation market concept, but they also do not criticize the exclusive use of the product market concept.

However, a closer look into the arguments reveals much more differentiated views. Since most of the scholars agree that merger reviews should look for possibly negative innovation effects, there is also a broad consensus about the necessity of identifying the relevant competitors in regard to innovation. In that respect, many would agree that the basic idea of the innovation market concept, to identify directly the innovation competitors, e.g., by asking for overlapping R&D projects or necessary R&D resources, is correct (see, e.g., Katz/Shelanski 2007a, 42). The question seems to be more, whether this should lead to a formal definition of innovation markets or whether the analysis of negative innovation effects can also be done either through a direct analysis of negative innovation effects of mergers⁶⁶ or through using the concept of future markets (which, however, are also not mentioned in the new guidelines).⁶⁷ The first solution of a direct assessment aligns very well with a much broader discussion in antitrust (also addressed directly in the new Guidelines, DOJ/FTC 2010, 7) that it might not be always necessary to stick to the traditional approach to first defining precisely the relevant markets before analyzing, in a second step, the competitive effects of the mergers. Although this seems to allow the agencies side-stepping the necessity of formally defining the markets, they somehow still have to identify the relevant competitors for analyzing the competitive effects of mergers (critical to this approach: Carlton 2010). On one hand, this general development makes the question of formally defining innovation markets less critical. On the other hand, it does not solve the problem that any competitive assessment requires the identification of the relevant competitors. Astonishing in this entire debate is that the (above-diagnosed) huge gap between the practice of the agencies in regard to innovation-specific assessment approaches and the new Guidelines has not been discussed.

Already in section 2.2 and 2.3, we have seen that one of the main critical questions is to what extent agencies can make presumptions from a higher firm concentration to negative innovation effects. In the reform discussion, there also was a broad consensus about the rejection of the use of general presumptions, claiming instead that innovation effects of mergers should be investigated through a case-specific, fact-dependent analysis. This reflects to some extent the opinion of Muris in the Genzyme/ Novazyme case (Muris 2004), in which he even rejected a presumption in the case of a 2:1 merger, and insisted on the specific analysis of the innovation effects in the particular case. We already mentioned that other scholars, e.g., Katz/Shelanski (2007a) have a different point of view by suggesting at least a weak (rebuttable) presumption in the case of a 2:1 merger in regard to innovation competition. However, for less extreme forms of concentration they also reject any presumption about the innovation effects of mergers and claim the necessity of a case-specific analysis. The guidelines give no guidance in regard to the use of presumptions. Beyond that problem, there is also a broad consensus in the U.S. discussion that innovation efficiencies should be taken into account.⁶⁸ Although

⁶⁶ See, e.g., Melamed in FTC (2009a, 55), Salinger in FTC (2009b, 7).

⁶⁷ For example, Kent (2011) favours the "future market" concept in comparison with the innovation market concept in his analysis of pharmaceutical merger cases.

⁶⁸ See AMC (2007, 77), Gilbert/Rubinfeld (2010), Katz/Shelanski (2007a), Carrier (2008), Garza in FTC (2009a).

the guidelines have addressed explicitly innovation efficiencies in section 10 (DOJ/FTC 2010, 30), it might remain unclear whether they really will play a role in merger cases due to the well-known difficulties of proving them.⁶⁹

Summarizing, in regard to innovation effects of mergers the new U.S. Horizontal Merger Guidelines of 2010 did not embrace the innovation-specific approaches that have been developed until 2008 by the antitrust agencies, especially by the FTC but also partly by the DOJ, in their merger cases since the 1990s. Instead, the Guidelines stick entirely to the traditional product market concept, implying that innovation is only considered in the competitive assessment part of the review. Also these parts of the guidelines remain sketchy, vague, and inconsistent, and offer no clear guidance how the agencies would protect innovation competition in merger cases. However, these guidelines reflect quite well the also very vague general opinion in the U.S. discussion about this topic, which acknowledges the problem and necessity of making such assessments, but simultaneously offers few specific advice how this should be done. In that respect, the entire discussion does not seem to have made very much progress since the proposal of the "Innovation Market Analysis" concept in the 1990s. Particularly striking is now the huge gap between the new Horizontal Merger Guidelines on one hand and the still existing Antitrust Guidelines about Licensing of Intellectual Property from 1995 with its clear inclusion of innovation markets (Feng 2012).

4.3 Perspectives for Future Research

Starting-point of our analysis in this paper was the question how the U.S. antitrust agencies have assessed innovation effects of mergers since the mid 1990s. We have seen that the agencies have used in many cases an innovation-specific approach for assessing innovation effects of mergers, which already considered innovation for identifying the relevant competitors. But our analysis also showed that they have not done this in a consistent way by also widely using a traditional product market approach or by not applying an innovation-specific approach consistently or offering only insufficient reasonings about the alleged negative innovation effects. In the last section it became also clear that this practice of an innovation-specific approach has not found sufficient approval for getting acknowledged in the last reform of the Horizontal Merger Guidelines, implying that the traditional product market approach with its inherent problems in taking into account innovation competition still dominates the guidelines, which might also have led to a setback in regard to the practice of the U.S. antitrust agencies. Therefore, on one hand, we see a surprisingly strong tendency of many antitrust scholars to cling to the well-known and well-accepted (static) product market concept with its primary focus on price competition. On the other hand, we also see a broad consensus for taking innovation effects seriously and a lot of new cases in all fields of antitrust and competition law, in which the agencies try to consider innovation effects, also often with still unclarified new theories about harm and vague new

⁶⁹ Vice versa, there was also critique that the consideration of the "ability of the merged firm to appropriate a greater fraction of the benefits resulting from its innovation is an efficiency" (DOJ/FTC 2010, 30) might be problematic, because "it could create an open-ended efficiency argument for virtually any merger in a concentrated market" (AAI 2010, 12).

concepts. From that perspective, we strongly suggest that it is necessary to think about new and fresh perspectives in regard to innovation in competition law, about the concept of innovation competition, and to what extent traditional competition law concepts are really capable of dealing properly with the innovation dimension of competition (see, e.g., Drexel 2012). In the following, we want to outline three different avenues for further thinking and research that we suggest might be worthwhile to pursue.

(1) Modern game-theoretic industrial economics has deepened the economic analysis of competition problems to a large degree and contributed a lot of valuable insights into the economic effects of many behaviors in market competition and now allows for a much more sophisticated economic analysis in specific cases, especially in combination with the many new empirical methods that can be applied. Whether these methods can fulfil the expectations they have raised, however, is open for debate. More important for the discussion about competition and innovation here is that this theoretical industrial economics approach is only partly well suited for analyzing the specific problem of innovation processes. As long as the analysis is about incentives for investing in R&D in situations of limited uncertainty and complexity with traditional profit-maximizing firms, this approach can contribute a lot to the analysis (as we have seen in section 2.2). However, in situations of high uncertainty and complexity with heterogeneous firms with different capabilities, and if we assume that the best solutions and research paths are not known, and creativity, knowledge, learning, and cross-fertilization are deemed as important, also other dimensions of innovation processes become very relevant, which cannot be dealt with within this paradigm. This is also the reason why in innovation economics different theoretical approaches are used, and the game-theoretic industrial organization literature represents only a (limited) part of the relevant literature. Overall, evolutionary approaches to innovation and other approaches as the "resource-oriented view" of the firm and strategic management literature in business administration (which are more compatible with evolutionary approaches than with industrial economics literature) are much more important for innovation research.

This insight leads to the necessity that if competition policy wants to take into account more the effects of market structures or business behaviors on innovation processes, then it has to look much more into the results of research beyond the traditional industrial economics literature, and turn directly to the huge and rich literature on innovation research. This might not be easy, because this (often empirical) literature is not only huge, but also not easily applicable to competition policy questions. But the general claim that we do know so little about innovation is (to a large extent) a myth, although we certainly know not enough how to make this literature about innovation usable for the application in competition law. This also refers to the necessity to think anew about our concepts of competition and what we mean by innovation competition. A lot of the problems we have in the discussion about the innovation market concept and whether a merger might have negative effects on innovation, stem also from the (paradigmatic) problem that innovation competition is analyzed theoretically still too exclusively from a traditional industrial economics perspective with its primary focus on innovation incentives, whereas other dimensions and benefits of competition, as those from a Post-Schumpeterian perspective, the experimental character of searching for better problem solutions (according to a Hayekian and evolutionary perspective), the importance of knowledge and (dynamic) capabilities, network effects and path dependencies, and the rich insights from innovation research tend to be ignored.

Many legal scholars in competition law still start with the idea that competition is about rivalry between firms for improving their products and services for the consumers. Perhaps it would be helpful to go back to Schumpeterian and Hayekian ideas about dynamic competition as an innovation-imitation process and as a process or parallel experimentation with new problem solutions and develop a new and clearer concept of innovation competition, with theoretical and empirical input from all the different approaches that do research about innovation and competition.⁷⁰

(2) It is a positive development that in antitrust proceedings the rigid scheme of defining the relevant markets first and then assessing the competitive effects on these markets is questioned despite its advantages for structuring the assessment process. From an economic perspective the definition of markets was always only a vehicle for identifying the set of relevant competing firms. In a concept of static competition, it was logical to use the set of current products and analyze their substitutability conditions from the demand (and the supply) side, in order to determine whether their suppliers have profitable possibilities for increasing prices, leading to the "hypothetical monopoly test" for determining the set of relevant competitors. As we have discussed in section 2.3, from a theoretical perspective it is clear that the set of relevant competitors in regard to innovation need not be identical with the set of relevant competitors in regard to price competition on an existing market with current products. Therefore the attempts to cling to the product market concept for defining the relevant competitors for innovation is theoretically deeply flawed. Since production and sale of products do not require the same resources and capabilities than innovation, a general assumption of such an identity cannot be defended. Therefore using a product market concept might only be used as a first step in a pragmatic solution, which however requires further analysis for correcting the possible errors of such an approach. As we have seen from our discussion of potential competition and future market concepts as alternative possible solutions, this also would require the identification of actual and potential innovating firms (section 2.2.3).

Therefore any real analysis of anticompetitive effects on innovation competition cannot avoid the identification of the relevant competitors for innovation. As a consequence, future research should focus on the question how and to what extent the firms can be identified, which innovate and/or have the capabilities for innovation in certain fields of research or in regard to the solution of certain problems. In that respect, the "Innovation Market Analysis" nearly twenty years ago started to ask the right questions about "overlapping R&D" and about the existence of "specialized assets" as patents, laboratories, specific know-how and experience, which also can be interpreted as barriers to entry into innovation competition. In what direction should a new approach be developed? Both theoretically as well as from the experience in merger cases, two different levels of analysis can be distinguished in that respect: The first level is competition between firms with already existing R&D projects, which only requires the observability of these R&D projects. There is a general consensus that in the pharmaceutical industry their identification is rather easy through the regulatory requirements of the market approval processes

⁷⁰ Some contributions to this discussion from an economic perspective are, e.g., Metcalfe (1998), Farrell (2006), Sidak/Teece (2009), and Kerber (2011) with many references. For a paradigmatic critique of the "Static-ization of Antitrust" through static industrial organization theory, see, e.g., Evans/Hylton (2008, 238-240).

(e.g., in the U.S. by the FDA) (see, e.g., Carrier 2008). In other sectors this might be more difficult. More ambitious might be a second level, and that is the level of the resources, specialized assets, and capabilities for innovation in a certain area. This is also theoretically a most interesting avenue for further research (about "market definition"), because such a resource-oriented approach to the identification of the set of relevant competitors might provide a much better concept for assessing the long-term effects of mergers on competition and innovation.⁷¹ For merger policy, this would imply the problem of maintaining a competitive structure in the sense of a multitude of independent sources for (so far unknown) future innovations.⁷² Such an approach depends to a large extent also on the development of suitable empirical methods how innovation, innovation capabilities, and necessary specialized assets can be identified. Experts in innovation research (and in the "resource-oriented view" of the firm) should be able to contribute to its solution. However, it is a crucial question, in which sectors and to what extent it is possible to identify the relevant firms and where this might not be possible. But as with many other new approaches (as e.g., the merger simulation models for predicting future price changes post-merger), it is a matter of experience where and to what extent such an approach can be applied.

(3) The third avenue for future research we want to propose might be the least controversial one, but it is very crucial for any progress in regard to the assessment of innovation effects of mergers. Already in section 2.3, we discussed briefly the necessity of developing a structured investigation and assessment approach that is capable of dealing with the problem that the innovation effects of mergers might be very different under different circumstances, in different sectors, and under different appropriability conditions (perfect/imperfect IP protection) etc.. In regard to the assessment of mergers in regard to price increases competition authorities have developed distinctions between coordinated and non-coordinated effects and further differentiations, each of which is treated differently in respect to what kind of assessment criteria are used, what has to be proved and to what extent ex- or implicit presumptions can be applied (and which empirical methods can be used for getting evidence). This has led to a structure of groups and subgroups of cases which are assessed differently in order to take into account that the mergers might have different effects on prices under different circumstances. The development of such a differentiated approach should also be the strategy of the competition authorities in regard to innovation effects of mergers. First attempts for distinguishing between different case groups already exist (see Baker 2007, Katz/ Shelanski 2007a, 64-67, Kern/Mantilla 2014), and especially the merger cases in the pharmaceutical industry show that also more sector-specific approaches might be very promising (Carrier 2008). According to the "error cost" (or decision-theoretic) approach in law and economics, it is a matter of the relation between the welfare costs of an additional differentiation between different case groups and the welfare costs through decisions errors in merger reviews (false positive / negatives) that should decide how differentiated such a system of classification of case

⁷¹ See also Sidak/Teece (2009, 616-618) who recommend the analysis of "capabilities" as proxies for the competitive positions of firms. Their argument is that "firms exhibit more stability in their capabilities than in their products" (ibid., 616).

⁷² According to Robinson (1999, 13) the basic idea of the DOJ in the Northrop/Lockheed defence merger case was "to maintain a number of firms with the capability of innovating to meet future national security challenges".

groups should be. Such a strategy would also allow for making progress in those industries and under those circumstances, where the problems of assessing innovation effects can be overcome. Furthermore, it would also allow to leave behind the outdated discussion whether a general relationship between market structure and innovation exists or whether we generally have enough knowledge about innovation for taking innovation effects of mergers into account.

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Appendix: Methodology for the Classification of the Concentration Levels

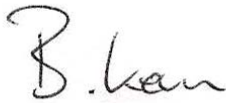
For the 242 markets with innovation aspects and quantitative concentration measures we encountered the problem that the agencies used three different measures (HHIs, market shares, number of competitors), which - despite some theoretical links with each other - cannot directly be translated into each other. As a consequence, we consolidated the different kinds of concentration measures and assigned them to three different groups: “low and medium concentration”, “high concentration” and “very high concentration”. In order to derive adequate thresholds for distinguishing the three groups, we used the FTC’s “Horizontal Merger Investigation Data”.⁷³ Here the FTC provided an overview on the post-merger HHIs on 1.055 markets in challenged merger cases within the period of FY 1996 to FY 2011, and sorted the HHIs into eight classes (0-1.799, 1.800-1.999, 2.000-2.399, 2.400-2.999, 3.000-3.999, 4.000-4.999, 5.000-6.999, and 7.000+). On this basis we calculated the terziles in order to obtain the thresholds for our three groups (“low & medium”, “high” and “very high” concentration). As a result, the threshold which differentiates the first from the second terzile lies within class five (3.000-3.999), and that between the second and third terzile within class seven (5.000-6.999). As a consequence we derived the three classes $HHI < 3.000$ (low and medium), $3.000 \leq HHI < 5.000$ (high), and $HHI \geq 5000$ (very high). Since the HHI is calculated by summing the squares of the individual firms’ market shares, the grouping of HHIs into “low & medium”, “high” and “very high” concentration also provides a rough guide for the respective grouping of market shares and the number of competitors into these three groups. This led to the following classifications for market shares and number of firms: markets with low and medium concentration ($HHI < 3.000$, market shares $< 45\%$, number of competitors > 4), markets with high concentration ($3000 \leq HHI < 5000$, $45\% \leq$ market share $< 70\%$; $3 \leq$ number of competitors ≤ 4), markets with very high concentration ($HHI \geq 5000$, market shares $\geq 70\%$, post-merger number of competitors ≤ 2 , i.e. that the mergers lead to a duopoly or monopoly). In those rare cases in which we encountered contradictions in regard to the classification (e.g., a market appeared to be “very highly” concentrated in terms of the HHI, but solely “highly” concentrated in terms of market shares), we took the HHI as the dominant criterion. Please note that all markets in which the agencies used non-quantitative or inconcrete concentration measures could not be included in this classification.

⁷³ See FTC, Horizontal Merger Investigation Data: Fiscal Years 1996 – 2011 (Jan. 2013), available at <http://www.ftc.gov/os/2013/01/130104horizontalmergerreport.pdf>.

Eidesstattliche Versicherung

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Rastatt, den 20. Oktober 2014



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